

Managing food price instability in developing countries

A critical analysis of strategies and instruments

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with the collaboration of Bruno VINDEL

AFD

Preface by Peter TIMMER

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cirad



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À Savoir

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Foreword

This book is to a great extent based on the results of a study conducted in 2009, called "Which instruments best tackle food price instability?" Financed by the *Agence Française de Développement* (AFD) and the French Ministry of Foreign and European Affairs (MAEE), the study was entrusted to the European Consortium for Agricultural Research in the Tropics (ECART). It involved four research institutions: the *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD), the *Institut de recherches et applications des méthodes de développement* (IRAM), the Natural Resources Institute (NRI) and the Wageningen University and Research Centre (WUR).

The study was directed by Bruno Vindel (AFD) and Benoît Faivre-Dupaigne (MAEE) and was coordinated by Franck Galtier (CIRAD). The study report was co-authored by Franck Galtier (CIRAD), Jonathan Coulter and Gideon Onumah (NRI), Gerdien Meijerink and Kees Burger (WUR) and Jean-François Sempéré (IRAM). These also coordinated the work packages on the different instrument categories.

Other researchers and experts also took part in the study, as follows: Roger Blein (Bureau Issala), Nicolas Bricas (CIRAD), Jérôme Coste (IRAM), Benoît Daviron (CIRAD), Johny Egg (INRA), Françoise Gérard (CIRAD), Denis Michiels (IRAM), Marcel van Asseldonk (WUR) and Tancrède Voituriez (CIRAD and IDDR).

A number of boxes have been included in the second chapter of this book. They provide a wealth of empirical evidences on instrument implementation. The following researchers and experts took part in preparing these boxes: Hashim Ahmed (EDRI), Kees Burger (WUR), Antony Chapoto (MSU), Jonathan Coulter (consultant, ex-NRI), Hélène David-Benz (CIRAD), Paul Dorosh (IFPRI), Johny Egg (INRA), Franck Galtier (CIRAD), Thom Jayne (MSU), Jackson T. Kiraka (EAGC), Elodie Maître d'Hotel (CIRAD), Anne Mbaabu (AGRA), Gerdien Meijerink (WUR), Denis Michiels (IRAM), Pamela Mulozi (ex-ZNFU), Nsanya Ndanshau, (EAGC), Gideon Onumah (NRI), Sam Rutto (EAGC), Jean-François Sempéré (IRAM), Peter Timmer (Harvard University and CGD) and Tancrède Voituriez (CIRAD and IDDR).

A preliminary version of chapter 1 of this book was circulated in the form of a working paper. We wish to extend our warmest thanks to the researchers and experts who, through their comments on this paper, enriched the analysis presented today in this book. They are: Jean-Marc Boussard, Derek Byerlee, David Dawe, Chris Gilbert, Christophe Gouel, Rod Gravelet Blondin, Thom Jayne, Paul Jorion, Adrian Mukhebi, Marc Sadler, John Staatz, Ludovic Subran, Peter Timmer and Steve Wiggins. They of course are not responsible for the opinions expressed in this book.

The conclusions drawn in this book, and its recommendations, are solely those of the author.

THE KNIGHT

I hear it often said by people who believe themselves to be agile of mind, that one should no more bother with wheat than with the leather of which to craft shoes; that no police order ensures the supply of shoes, and yet one has never been unshod.

THE COUNT

That is most true, and this reasoning has always appeared to me to be sound. Do you not find it to be so?

THE KNIGHT

Assuredly not.

THE COUNT

And why so? Are shoes not almost as necessary as bread?

THE KNIGHT

I grant you that, but should the need for the one and the other be equally great, that for the shoes is not so pressing. [...]. Thus, all other commerce may run itself for in all there is some time, and sufficient to restore an equilibrium. But the supply of bread is pressing and must be safeguarded, for should the equilibrium arrive too late, the people will already have starved to death.

Ferdinand GALIANI
Dialogues sur le commerce des blés
(1770 : 165-166)

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Preface

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Franck Galtier and his colleagues have produced an essential guide book to managing food price volatility. This is important for two reasons: first, just five years ago the economics profession thought such a guide was not only unnecessary, but wrong-headed. Now there is a serious re-thinking of these issues. Second, and more personally, the themes developed in this book resonate with my own work over the past four decades. There is a certain satisfaction with “coming in from the cold,” to seeing the issue of food price stabilization back on the policy and academic agendas.

As fate would have it, this longstanding concern for food security, and the role of food price stability in the political calculus of developing countries, also caught the eye of the Global Development and Environment Center (GDAE) at Tufts University, which awards annually the Leontief Prize for Advancing the Frontiers of Economic Thought. The prize this year honored research and policy analysis in agricultural and food policy, and I was asked to represent this field, with Michael Lipton, for the award.

As the Galtier volume notes, the field nearly disappeared from academia after the mid-1980s, when commodity prices collapsed and no one thought increasing agricultural output was a good idea. Most departments of agricultural economics now devote themselves primarily to natural resource and environmental economics. Agriculture is just one of several sub-fields in these departments.

Such a trend might be understandable in the United States, where we now have more lawyers than farmers. But this change in focus, and capacity, severely hampers the ability of US-trained academics – foreign and domestic – to understand the role of agriculture in the development process. Consequently, in academia and in the donor community, we forgot about agriculture and stopped funding it. Jobs disappeared. Despite running a food policy program at Harvard for over two decades, I sent

[1] This Preface draws on material developed for an address delivered at the ceremony awarding the Leontief Prize for Advancing the Frontier of Economic Thought, April 3, 2011. The prize is awarded by the Center for Global Development and Environment (GDAE), Tufts University, Medford, MA. Relevant publications that developed the analytics and empirics of the story outlined here are listed in the main bibliography.

more students to Goldman Sachs than to careers in agricultural development or food and nutrition policy (they were smart students – they went where the jobs were...).

That neglect has now come back to haunt us, because the jobs are back, but the students are not. As I reflect on this, I realize that I was chosen for the Leontief Prize because I am an economic historian, not an agricultural economist. Economic historians cannot forget about agriculture – it was usually three quarters of the economy that we studied – and I never stopped arguing for its key role in the development process. It seems useful to bring that historical perspective to the debate discussed in this volume.

Stabilizing food prices has remained on my intellectual agenda for decades. Out of a deep conviction that raising agricultural productivity was the essential first step in propelling a society out of its traditional agrarian structure into a dynamic process of modern economic growth, a body of work was generated that often seems disconnected to outside observers (and largely irrelevant to mainstream economists), but which has a common intellectual strand, at least to me, and much of it shows up in this volume.^[2]

Six big lessons of this work are presented here to provide historical context to the Galtier volume. All challenge the results produced by the standard neoclassical model used by economists to analyze policy issues. Keeping with the focus on the importance of agriculture in the development process, the lessons revolve around food and agriculture. Although standard neoclassical models provide a starting point, the approaches are eclectic and stress empirically-based analysis. All of this work has an empirical focus, with factual data behind it. I have learned that in policy debates, “three facts trump a theory.” Analysis based on facts is accessible to policy makers. This is also a key theme of the Galtier volume.

1. The first, and perhaps the most important lesson, is that economic history matters. Path dependency, beachhead effects, and hysteresis in economic activity are common features of innovation, trade and investment decisions. Neoclassical models can capture these effects, but they must be empirically based and are often unique to specific case studies. The fact that these cases are usually not generalizable makes them of little interest to mainstream economics. My economic history professor, Alexander Gerschenkron, used to say in his research seminar that “for example is not proof... but it does show that something is possible.” Mainstream economics is not nearly as interested in the merely possible, when proving a theorem is a general result.

[2] The key references that are at the core of this body of work are listed in the main bibliography.

History is full of specific examples from which insights can be gained, but general theorems not proven. I co-taught – with Dwight Perkins and Jeff Williamson – the introductory Ph.D. class in economic history at Harvard (Gerschenkron's old class), which also served as the introductory course in development economics.^[3] My lectures examined the process of industrialization through the lens of the agricultural sector – what policies were needed to stimulate agricultural productivity? In turn, what was the role of rising productivity in agriculture in stimulating broad-based economic growth, and how was it transformed in turn during this process? I was able to use computable general equilibrium models constructed by the economic history (and development) profession for an historically and geographically important set of countries – across two continents and three centuries.

- England, during the era of the Corn Laws from the late 17th century to the early 19th century. The Corn Laws protected English grain farmers and – as noted by Franck Galtier – also stabilized domestic grain prices. The result was arguably to stimulate the first agricultural revolution and provide the food, labor and market for the first industrial revolution;
- France, as it fell behind a rapidly developing England in both rural and urban productivity. France only began to catch up in the latter half of the 19th century when it abandoned its long-time strategy of “provisioning Paris” as cheaply as possible, and began to provide policy and investment support to the smallholder farmer who dominated French agriculture. That support included minimum price supports for farmers and protection from cheap imports;
- Germany, with rapid industrialization as a “conscious act of national policy,” where Bismarck forged his “pact of steel and rye” to stimulate productivity growth in German factories and on German farms. Again, price protection for German cereal producers was a key feature of this pact;
- Russia, with its “forced pace industrialization” directed by rigid, centralized plans, which would not have been possible without systematic and harsh extractions of agricultural surpluses from the peasantry. The failure to develop a modern agricultural economy, and to provide income support to Soviet farmers, was one major factor in the ultimate collapse of the Soviet Union;

[3] This macro, historical approach to economic development, which was unusual even at the time, although not totally unique to Harvard, has now disappeared entirely from the curriculum of leading universities teaching development economics. Although much is to be learned from randomized controlled trials (RCTs) as an approach to understanding what works and what does not, RCTs cannot answer the big questions in economic development

- Japan, where very early investments in raising productivity on small farms paid high dividends in feeding a growing non-farm labor force, and providing the workers for it. As with earlier agricultural success stories, rice policy in Japan provided both stability and protection to Japanese farmers;
- Thailand, where a land frontier made growth of extensive agriculture possible, in contrast to Japan, but also made universal education much more difficult to achieve for both supply reasons (a widely scattered rural population is hard to school efficiently) and demand reasons (farm labor was not surplus and children were needed to work the land). Thailand fell systematically behind Japan in per capita incomes after 1880 as this education gap widened, but also because Thailand taxed its farmers heavily and exposed them fully to the volatility of world rice markets; and finally
- Indonesia, the country where I learned about modern development issues (from the point of view of an economic historian as well as a commodity specialist). A more-than-century-long struggle to achieve food security at the national (macro) level was finally capped by an extraordinary spurt of rural-oriented, pro-poor growth that pulled more people out of poverty in a 3-decade period than ever before.^[4] China ultimately topped that record, but Indonesia showed the way, as the box 13 later in this volume indicates.

2. Food price stability is a good thing, not a bad thing, which is the starting point of the Galtier volume. The standard model of international trade can show "gains to trade" from highly unstable food prices, *but these gains are illusory*.

Do not mistake my point. I believe deeply in the role of markets in exchange and price discovery and as the foundation for economic specialization.^[5] Markets usually get these right, and governments usually get them wrong. But not always. And the exceptions are important, especially in matters of health, education and food security.

[4] "Macro" food security refers to a society-wide sense that food is reliably available in urban markets and that adequate purchasing power is a sufficient condition for accessing this food. "Micro" food security requires that all households (urban and rural) have access to sufficient food, but that is only possible when poverty has been eliminated. "Macro" food security is often confused (especially politically) with food self-sufficiency, but imported food often plays a key role in providing macro food security.

[5] Indeed, I have often been accused of being too market oriented, including by the co-awardee of the Leontief Prize in 2102. My book on *Getting Prices Right: The Scope and Limits to Agricultural Price Policy* (Cornell, 1986) was often interpreted as a manifesto for free trade in food and agricultural commodities. But that was only for people who had not read it. Still, I am perhaps the only Leontief Prize winner who also received an award from the American Enterprise Institute (I served as their Wendt Lecturer in 2007). Markets really are important – too important to let them fail.

To my consternation (and secret delight), food price volatility is finally back on the intellectual and policy agenda, with this volume as an especially welcome addition to the literature. My 1989 article that laid out the analytical case for stabilizing food prices is being cited again – it provides the key analytical arguments in the Galtier volume that justify the attention to managing food price volatility. It is not easy to stabilize food prices, but it is not impossible either. We just need to stop arguing that stable food prices are a bad thing and get on with the tough analytical and empirical work to learn how to do it effectively, efficiently, and honestly. This volume is a critical first step in this direction, answering both “why” to stabilize food prices, but also “how.” The “ABCD Framework” which was widely circulated in an earlier Working Paper, is already used as the standard methodology for thinking about how the various approaches to managing food price instability relate to each other. The exclusion of “C Mechanisms” from the policy debate since the mid-1980s (*i.e.* government efforts to stabilize food prices directly through reserve activities or border controls) is shown to leave society with an incomplete set of tools to address this critical issue.

3. Day-to-day prices in world commodity markets are a bad guide to long-run decisions on funding agricultural research and investments in rural infrastructure. “Do markets provide the right signals” to getting agriculture moving? Often not.

Private decision makers in market economies have little choice but to follow market prices closely as a guide to investment decisions, crop choices and food consumption patterns. But governments, universities, public research institutions, donors and foundations are not bound by the same short-run dictates of profit maximization or cost minimization. Longer-run decisions about investments in agricultural research and technology, rural infrastructure and supportive public policies should be based on longer-run opportunity costs. Only when they are, can we break the recurrent cycle of world food crises that seem to strike every three decades or so.

4. Economic structure matters to the rate and distribution of economic growth. “The structural transformation in historical perspective,” the introductory Ph.D. course at Harvard for both economic history and development mentioned earlier, offered many relevant lessons for modern development strategies. With half of its population still working in an agricultural sector with low productivity, a country faces opportunities and constraints that are vastly different from those facing a country that has already modernized its agriculture and is mostly through the structural transformation. A country undergoing rapid economic growth will also be undergoing a rapid structural transformation, and the changed structure of

the economy 2-3 decades into the future needs to inform current investment strategies for such long-lived assets as education, health care and infrastructure.

Structure also matters in the short-run, despite assertions by macro economists that it does not. Justin Lin, vice president and chief economist at the World Bank, is trying to revive the role of economic structure in development models, but that is a difficult task if factor markets are *assumed* to be working pretty well. The whole reason that sectoral structure is important in economic development is precisely because these markets, even many commodity markets, are not working well in the conditions of poor countries. These failures tend to have a number of unique characteristics in each country, and time period, thus explaining why “one size does NOT fit all” in food policy analysis, design, and implementation. This is also a theme emphasized in this volume. One clear example is the “domain of relevance” for stabilizing food prices. Rich countries can live with substantially more instability in food prices than can poor countries, if for no other reason than Engel’s Law.

5. Pro-poor growth is feasible and comes with low opportunity costs in the long run. Markets do not usually get this right, and active government intervention is needed to ensure that the poor participate in, and contribute to, the growth process. One of the main entry points for government intervention is through investments to raise agricultural productivity and to stabilize the prices of key outputs.

We have lived for long enough with the assertion that initial income distribution does not matter to the rate or distribution of economic growth. Clearly it does, even in rich countries. The key question is whether the existing political economy can frame a set of public policies and investments that consciously seek to include the poor in a process of economic growth. The Asian experience, where investments to enhance macro food security had a high political imperative whatever the form of government, suggests that investments in raising productivity on small farms, while building human capital within those farm households, was the surest pathway out of rural poverty.

A way must be found to make markets work to deliver long-run growth, but political survival requires that this growth be stable and equitably distributed.^[6] No alternative exists to organizing economies around market-based transactions

[6] The source of the measurable “unhappiness” of many citizens in the transition economies of the former Soviet Union can be traced primarily to unprecedented instability in incomes, growing income inequality, and the loss of public goods. Most Asian governments consciously tried to balance “equity, growth and stability” during their early periods of rapid industrialization.

if societies are to reach their goals of greater material welfare and broad political freedom. *Markets produce both*. But markets also fail in important social tasks, at least during turbulent times when short-run price signals are hard to interpret. Responsible governments must find a way to prevent those failures through careful regulation and to alleviate them when innocent workers and consumers cannot participate in the promises of market outcomes. This volume by Franck Galtier provides clear guidelines on how to do this.

6. "Political economy" is a behavioral field, not a field of positive economics, so understanding why political leaders try to stabilize food prices when their economic advisors tell them it is a bad idea will require a new approach. The foundation for understanding modern political systems and policy options lies in understanding how citizens regard their relative economic status, the impact of changing economic prospects on their behavior, and their sense of security and control, all within the framework of government policies and services.

Economists are often upset when politicians reject their optimal policy designs to enhance social welfare. Traditionally, these designs have been based on the Pareto criterion that at least one individual is better off and no one is worse off. But if most individuals care more about their relative status than absolute levels of income or consumption, the Pareto criterion spells political trouble. Only a new behavioral focus on the design of policy interventions can help real policy makers bring about real improvements in welfare.

The neo-classical solution to food price instability, as explained so clearly by Franck Galtier in this volume, has been to allow full expression of price volatility in markets because of the information content of prices. Any problems for firms in the supply chain can be managed with financial instruments to hedge price risks. Problems for poor consumers can be managed by implementing safety nets that kick in when food prices spike.

This approach fails at both ends, as this volume stresses repeatedly. The financial instruments are themselves very volatile and subject to outside speculative pressures, are not widely accessible to most market participants, and fail to exist at all in many developing countries.

Emergency safety nets face their own problems of transactions costs and behavioral responses that make effective implementation very difficult. Using community-based information and organizations to target resources to the poorest of the poor often runs afoul of the widespread sense of fairness in these communities that requires external resources to be shared equally. Targeting is thwarted and fiscal

costs rise, or the poor do not get the resources they need to cope with shocks to their welfare. Either way, safety nets have a poor record of coping with sudden price shocks.

The empirical regularities of behavioral economics, especially loss aversion, *time inconsistency, other-regarding preferences, herd behavior, and framing of decisions*, present significant challenges to traditional approaches to food security. The formation of price expectations, hoarding behavior, and the welfare losses from highly unstable food prices all depend on these behavioral regularities. At least when they are driven by speculative bubbles, market prices for food staples (and especially for rice, the staple food of over 2 billion people), often *lose their efficiency properties and the normative implications assigned by trade theory*. Theoretical objections to government efforts to stabilize food prices thus have reduced saliency, although operational, financing, and implementation problems remain important, even critical. Understanding *these* problems does not yield to broad theorizing, but depends fundamentally on local realities on the ground.

Beyond reducing food price instability, building the institutions and human capital to sustain inclusive economic growth will be essential. It may be that finding a way to allow governments to deliver effective and efficient safety nets that are part of the long-term structural approach to solving poverty will be the key to allowing markets to deliver their long-run promise. If so, designing and implementing them becomes the essence of effective policymaking. But governments, like the poor, live in the short run. Their vision and strategic design for inclusive, stable, long-run growth must survive the day-to-day challenges of managing power. Only input from “behavioral political economy,” broadly for development policy and more narrowly for food policy, can help governments to meet these challenges. This volume is a critical first step in recognizing the depth of these challenges, and in building the understanding to meet them.

Summary

The consequences of food price instability for developing countries (DCs). *Food price instability inside DCs* is generally very marked and has serious consequences: it affects food security (some poor households are obliged to reduce their consumption as prices rise), and obstructs green revolutions (producers do not invest if prices are too unstable). This in turn compromises the entire process of economic development (Timmer, 1988; World Bank, 2007). In some cases, price instability can also cause political and macroeconomic instability. *Food price instability on international markets*, which affects DCs in various ways, has grown over the last few years and could continue to do so under the impact of climate change, decreasing global grain stocks, the boom in biofuels and the increasing financialization of agricultural futures markets. This instability may further increase producer and consumer price instability in DCs. In certain importing DCs it may also cause balance of payments problems resulting in import rationing or a reduced exchange rate. *The problem is further accentuated by the fact that food price instability on both a national and international scale is a self-sustaining phenomenon* for it prompts behaviors that tend to cause even more instability, e.g. low levels of agricultural investment, mean that production remains highly sensitive to weather hazards and little responsive to price incentives; household self-consumption strategies and country self-sufficiency strategies, leading to market narrowness; and restrictions on exports when prices soar.

The crisis of conventional solutions. How can food price instability be managed? Ever since the late 1980s, a specific doctrine has dominated both in academic and political circles and inside countries and internationally. Its main message is that it is preferable *to reduce the effects of price instability without impeding price fluctuations*. This can be achieved by encouraging trade, managing price risk (through private insurance instruments) and managing crises (through emergency aid). But this doctrine was called into question in the 2000s: the 2005 crisis in the Sahel highlighted the limitations of emergency aid and the 2008 crisis on the international markets clearly demonstrated the limitations of solutions based on free trade and risk management.

Fresh thinking. Fresh thinking was therefore required in this field that had been almost entirely abandoned by researchers for 25 years. A study was commissioned in 2009 to review the theoretical and empirical knowledge in this field and make recommendations. It was financed by the *Agence Française de Développement* and the French Ministry of Foreign and European Affairs (MAEE), and was entrusted to a

European consortium, ECART. Based on a comprehensive review of the theoretical literature and lessons learned from past experience, this study led to a critical evaluation of the different possible options for managing food price instability. It is this critical evaluation that is presented herein.

The range of possibilities. We kicked off by distinguishing between the different possible strategies based on whether they aim to manage food price instability by stabilizing prices or by reducing the effects of price instability. We then considered how action could be taken, based on the market or on public interventions. This led us to define the four following strategies:

		Goal	
		Stabilize prices	Reduce the effects of price instability
Means	Based on the market	Strategy A	Strategy B
	Based on public interventions	Strategy C	Strategy D

Prices may be stabilized by making food markets more efficient: this is strategy A. It is based on the idea that rendering production more responsive to price incentives, and boosting storage and facilitating trade will stabilize prices by balancing surpluses and deficits between years and between areas. Market instruments may also be used to ensure that price instability does not generate income instability: this is strategy B that relies mainly on futures markets and agricultural insurance. Finally, public interventions may be used either to prevent prices from reaching extreme high- or low-values (strategy C), or to transfer goods to vulnerable households (strategy D). In the first case, the government regulates the quantity available on the domestic market by using public stocks or measures on imports or exports (tariffs, subsidies, quotas or bans). The second type of public intervention takes the form of targeted transfers and may vary with the nature of the goods being transferred (food, cash, food vouchers, inputs or assets), the level of support (free distribution or simple subsidy, as in the case of moderately priced sales), the matching contribution (if any), the definition of the beneficiary group, and whether transfers are activated structurally (to recapitalize vulnerable households) or only in emergency situations. These four A, B, C and D strategies (which rely on different instruments) are complementary, not exclusive, and should be considered as “pure” strategies that can be combined to form “mixed” strategies.

The current controversy: risk and crisis management *vs* price stabilization. The dominant doctrine since the 1980s has been, and still is, based on risk management (strategy B) and crisis management (strategy D). Although it considers that food markets play a positive stabilizing role and recommends doing away with all trade barriers, it does not go as far as to push for proactive market modernization (strategy A). It also condemns any public interventions made to stabilize prices (strategy C). Dealing with the consequences of instability rather than with instability itself (which is the core of the doctrine) offers the opportunity to provide different levels of protection: by paying a higher premium, the most risk-averse actors can acquire more protective B-instruments; D-instruments are targeted on the households most in need. However, despite this advantage, the doctrine may be considered to have failed. The much anticipated development of risk hedging instruments (B-instruments) never materialized in DCs. And the D-instruments used were unable to prevent vulnerable households from suffering decapitalization and falling resilience, and therefore failed to protect them from food insecurity (as highlighted by the 2005 Niger food crisis, *cf.* Michiels and Egg, 2008). The very rationale behind the dominant doctrine (founded on risk and crisis management) was called into question.

Should an alternative option be given its chance, based on a reduction in price instability? Some are against this option on the grounds that as prices aggregate information on the scarcity of goods, and as this information guides production and trade behaviors, any moves to prevent prices fluctuating freely will be prejudicial to the appropriate allocation of resources. They also hold that producers are covered by a kind of "natural insurance" where price risk and production risk partially compensate one for the other (for when harvests are poor, then prices are high, and *vice versa*). As price stabilization would reduce the correlation between prices and harvests, this could ultimately increase the instability of producer incomes (Newbery and Stiglitz, 1984).

However, if the different causes of price instability are considered, it can be seen that the scope of these criticisms is greatly reduced. For instance, *in situations of "endogenous" instability (panics, speculative bubbles, cobweb), prices, rather than conveying the appropriate information, tend to mislead economic actors*. In these situations, price stabilization is liable to improve resource allocation. Moreover, even in the absence of "endogenous" instability, price stabilization may still improve resource allocation by improving the quality of price expectations on which production and storage decisions are based. And regarding producer "natural insurance", it only comes into play if there is a negative correlation between price and the harvest volume for individual farmers. But this is rarely the case, particularly when the product is traded over a sufficiently large area (nationally, regionally or internationally) for climatic shocks

not to be correlated. The arguments put forward against price stabilization are therefore ill founded. By contrast, public intervention is necessary to prevent food prices from reaching extreme values in DCs. This protects vulnerable households from price spikes (thus contributing to maintaining their resilience by reducing their need to sell assets) and producers from price risk (thus stimulating agricultural investment and green revolutions, as happened in European, North American and Asian countries).

How can prices be stabilized? The aim is not to stop prices from fluctuating, but simply to stop them reaching extremely high or extremely low levels. Which instruments should be used to achieve this? As the effectiveness of the different instruments depends greatly on the different causes of price instability, we analyzed which instrument should be used to counter each cause of food price instability in DCs:

- “natural” instability stemming from harvest concentration in time and sensitivity to natural hazards such as rainfall, disease and attacks by pests;
- “imported” instability due to international price instability being passed on through imports and exports;
- “endogenous” instability due to the dysfunction of domestic markets: panics, speculative bubbles and cobweb dynamics.

As the price instability of a given product in a given country may be due to several causes, and as these causes may be difficult to identify, it is necessary to design and implement a stabilization scheme that can counter all these causes. We show that such a scheme must be based on instruments that facilitate the modernization of production (pillar 1) and markets (pillar 2), on information systems that provide price and harvest forecasts (pillar 3), and on public instruments of market intervention (pillar 4). The scheme in question is therefore based on a combination of A-instruments (pillars 1, 2 and 3) and C-instruments (pillar 4).

What accompanying policies should be used? From food price stabilization schemes to food price instability management schemes (FPIMS). Stabilizing prices is not enough. Even a moderate price increase may be sufficient to push some poor households into the red. If insolvent consumers are to be protected from food insecurity, they need help during price shocks (this is the role of emergency aid) and they need to be recapitalized in order to increase their resilience (this is the role of multiannual safety nets). Also, in the medium and long term, if price stabilization allows a green revolution to take place, then many households will have to leave agriculture. Social transfers then have a major role to play by helping them during this structural mutation, namely dealing with problems arising from a shortage of non-agricultural jobs in rural

areas and the resulting exodus to the towns. D-instruments are therefore a crucial part of the food price instability management scheme: this is pillar 5. Insurance-based instruments (B-instruments) also have a role to play. Firstly, given that price stabilization policies do not affect harvest risk and do not entirely neutralize price risk (as they allow prices to fluctuate within a set band), it may be useful to encourage DC producers and traders to use B-instruments. Also, whether they aim to stabilize prices (C-instruments) or support vulnerable households (D-instruments), public interventions may simply transfer the instability to the State budget. The State (or donors) can hedge against this by using futures markets or weather insurance (Faruqee *et al*, 1997; Dana *et al*, 2006). This dual role of B-instruments constitutes pillar 6.

On what scale should DC domestic price instability be managed? Although price instability management schemes have hitherto nearly always been implemented on a national scale, the idea of a regional approach is drawing increasing interest. Expected benefits include economies of scale, a greater market stabilizing effect (as the regional market more greatly diversifies the weather risk by connecting a larger number of production areas) and reduced spillover effects caused by the “porosity” of borders between the countries in a given region. But the regional scale also has disadvantages, due to its need for collective action.

How should price instability management schemes (FPIMS) be governed? The main problem is how to coordinate public and private instruments. The literature often pits C and D-instruments against A-instruments: the constant threat of a public intervention that is likely to drive prices down is thought to cause private actors to stock or import less. This “crowding out effect” may ultimately lead to public interventions increasing, instead of decreasing, price instability (Govereh *et al*, 2008; Chapoto and Jayne, 2009). But compliance with a few simple rules means that public and private instruments can cohabit harmoniously. Firstly, public interventions must be predictable, meaning that they must follow rules that are known to all. For example, stabilizing interventions must only be triggered once a predefined floor price or ceiling price has been reached. Secondly, these intervention prices must be set at realistic levels in consideration of production and marketing costs, consumer purchasing power, and the State’s limited resources (too high a floor price will result in an extremely expensive intervention and may thus compromise the scheme’s financial sustainability, whereas too low a ceiling price will discourage private storage). Finally, State interventions must follow open, competitive procedures (calls for tender, auctions) to avoid any collusion between State agents and private actors.

What role does the international community have to play? The international community has a key role to play in the success of these policies: it should help DC governments finance their food price instability management scheme (FPIMS) and create a more favorable environment by reducing price instability on international markets. This can be achieved both through policies that target certain causes of instability (such as the lack of information on stocks, excessive speculation on futures markets, the boom in biofuels, and climate change) and through policies that aim to increase global stocks (thus reducing the amplitude of price surges, whatever their cause).

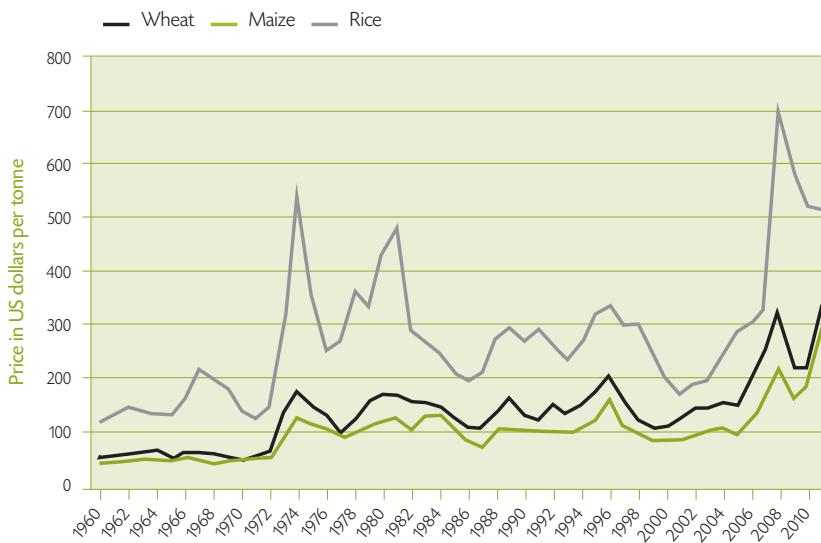
How can the schemes (FPIMS) be adapted to suit each case? Choosing a combination of instruments suitable for national or regional specificities. The FPIMS must of course be modulated to suit each context: the instruments chosen and their combination must consider the specificities of the different countries or the Regional Economic Communities in question. In order to provide guidance on these choices, the second part of this book describes the main advantages, limitations and perverse effects of the different instruments, and the complementarity and substitutability relations between them. The main obstacles to instrument development are presented, and the means to overcome them are discussed. Text boxes provide a wealth of empirical evidences and lessons learned from different countries of Africa, America and Asia.

Introduction

The 2008 price crisis coupled with the urban riots it sparked in some 40 developing countries and the media attention it drew served to heighten the awareness of policy-makers, researchers and public opinion to the problem of food price instability.

Food prices often undergo roller-coaster variations with surges being followed by collapses. The plots below illustrate the magnitude of this phenomenon both on international markets and in developing countries (see figures 1 to 3).

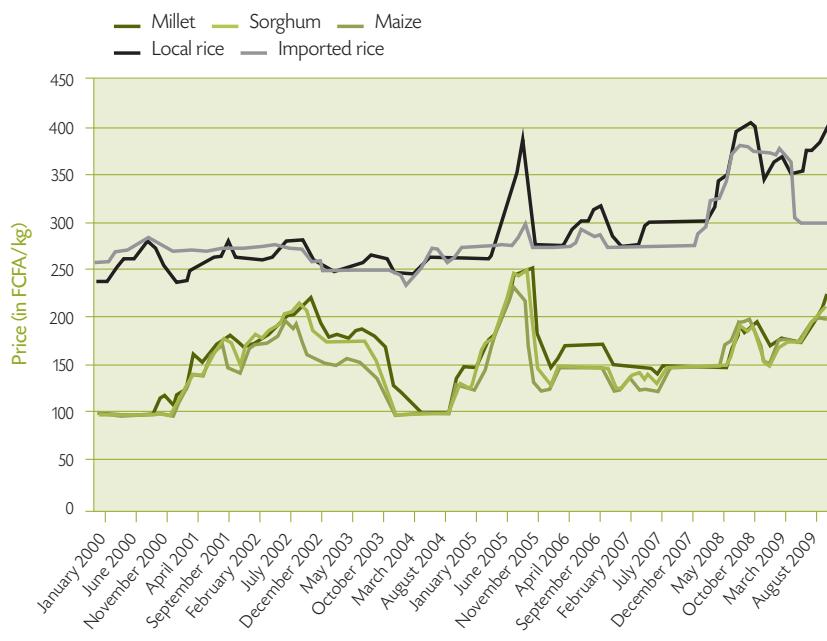
Figure 1 *Grain prices on international markets since 1960*



Source: IMF.

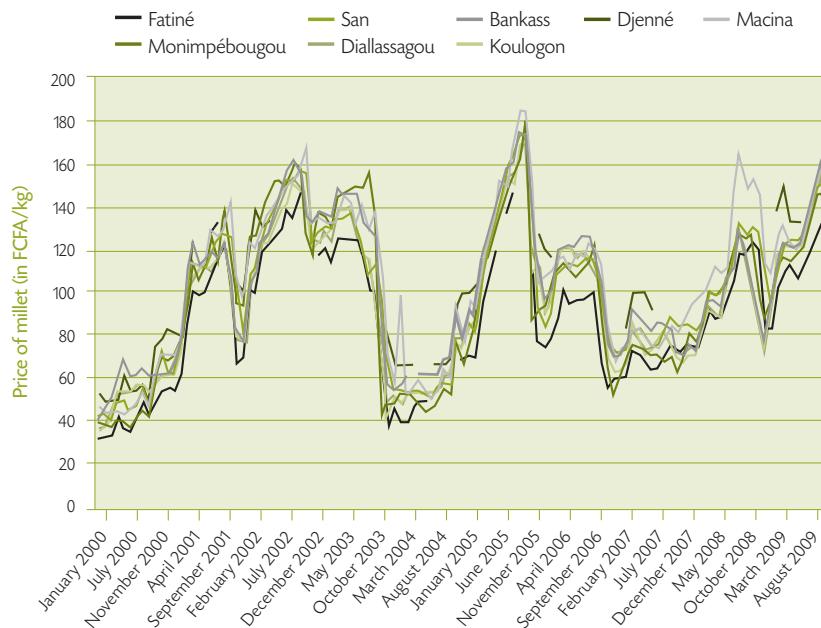
Although most media attention focuses on international price instability, it is food price instability in developing countries (DC) that has the most serious consequences as it directly impacts on the income of DC producers and the purchasing power of DC consumers. International price instability above all becomes a major problem when it generates price instability in DCs (as occurred in 2008). Moreover, the international market is only one source of instability among others. And in actual fact, price instability in DCs often has mainly internal causes. For instance, the price of millet was subject to great instability in Mali between 1994 and 2007 despite the fact that grain prices on international markets were relatively stable over the same period (as illustrated by the amazing stability of the price of imported rice in Mali, see figure 2). The main problem to be tackled is therefore food price instability *inside developing countries*, with action on international prices being simply one means (among others) of contributing to this.

Figure 2 *Grain consumer prices in Bamako (Mali) since 2000*



Source: Observatoire du marché agricole.

Figure 3 Millet producer prices in Mali since 2000



Source: Observatoire du marché agricole.

Food price instability has very serious consequences in developing countries for it impacts on:

- **food security**, with some poor households being obliged to reduce their consumption when prices rise;
- **agricultural modernization**, as producers do not invest if prices are too unstable; this brings green revolutions to a standstill and subsequently obstructs economic development (Timmer, 1988; World Bank, 2007);
- **political stability**, if price rises spark urban riots;
- **macroeconomic stability**, as food price instability may in certain cases affect the State's budget, the trade balance, exchange rates or even growth and inflation rates.

Moreover, food price instability is a self-sustaining phenomenon as it prompts behaviors that tend to maintain high levels of instability (vicious circles).

Price instability means that production remains highly sensitive to climatic hazards and little responsive to price incentives (and this in turn maintains price instability). Price instability generates a risk for farmers, which leads them to invest very little (both because they are risk-averse and because banks are reluctant to lend while the price risk is high). These low levels of agricultural investment mean that production remains highly sensitive to climatic hazards (with very little use of irrigation or drought-resistant varieties) and responds only sluggishly to price incentives, with producers finding it difficult to boost production when prices rise. But production sensitivity to climatic hazards and its poor responsiveness to price rises further accentuates price instability. Price instability and low agricultural investment therefore form a vicious circle.

Another vicious circle is formed between price instability and market narrowness. When faced with unstable prices, it is perfectly rational for households to develop self-consumption strategies, *i.e.* producing what they consume, no more, no less. This leads to market narrowness. For instance, it is considered that less than 20% of the millet and sorghum produced in Sahel countries is actually marketed. But this market narrowness further enhances price instability. The same vicious circle is seen on the international scale. Countries react to international price instability by developing food self-sufficiency strategies. This narrows the international market and further enhances price instability.^[1]

The outlook is bleak indeed when we realize that price instability could worsen in the years to come given that different parameters are working together to render food prices even more unstable. First is climate change that should cause more marked hazards and in consequence more variable agricultural production. Second is the fall in global grain stocks caused by recent changes in agricultural policies in the USA, the European Union and China (Mitchell and Le Vallée, 2005). Third is the development of biofuels that creates a relationship between energy products and the price of certain food products such as maize, rapeseed and sugar. Changes in the price of a barrel of crude oil are therefore liable to have an impact on food prices. The fourth parameter concerns changes taking place in futures markets. This inter-connection between agri-

[1] Today, only 10 to 11% of all grain produced worldwide is traded internationally. This percentage could further shrink in the near future as many countries are developing self-sufficiency strategies in the wake of the 2008 crisis. An idea as to the magnitude of the phenomenon is provided by the land investment tables drawn up by IFPRI (Von Braun and Meinzen-Dick, 2009) and the International Land Coalition (<http://landportal.info/landmatrix>).

cultural and energy prices could be further strengthened by the recent boom in the trading of indices composed of these two commodity categories (Masters and White, 2008b). Also, over the last few years, many traders have been using agricultural commodities futures ("ags") to diversify their portfolios. This has created a relationship between the prices of securities and agricultural commodities. A crash on the securities market can therefore result in a massive transfer of funds to ags, and this is liable to create a speculative bubble. The 2008 crisis – where all the above-mentioned factors may have played a role – may thus indicate that we have entered a new era characterized by far more pronounced food price instability than has prevailed over the last 20 years.

What can be done? A great many papers have been published on the instruments that can be brought into play to reduce price instability or mitigate its effects. These publications are run through with lively controversy between partisans of stabilization and supporters of mitigation, between those who place their trust in private instruments and those who believe that public intervention is necessary. It is this literature that we have reviewed and discuss herein.

This book is based on three methodological choices

The first consists in covering all the possible strategies and instruments that can be brought into play to manage price instability. This review of the different options, and the overview it provides, are necessary in order to design effective and efficient schemes to manage food price instability. Regarding its comprehensive approach, our study follows on from that of Byerlee *et al.* (2005).

The second choice consists in not pitting *a priori* one category of instruments against another, in considering that market-based instruments and those based on public intervention may be complementary and synergetic, as are instruments that aim to reduce price instability and those intended to attenuate its effects. With regard to this point, the study presented herein is a continuation of work – based on a number of Asian success stories – that recommended the pragmatic stabilization of grain prices in DCs by an approach combining private and public instruments (Timmer, 1989; Dawe, 2001).

Finally, the third choice consists in not considering that there is any universal solution to food price instability, but rather that the optimal solution depends on the context. This study therefore, in regard to this point, remains firmly on the tracks laid down by Galiani (1770), who showed, in his time, that in matters of managing grain price instability, what is beneficial here may be harmful there, and *vice-versa*. More parti-

cularly, it takes up the idea that the relevance of the different instruments depends on the cause of the instability. This means that different instruments must be used depending on whether the instability arises from exogenous shocks or the endogenous dynamics of the markets (Ezekiel, 1938; Boussard *et al.*, 2006), and whether it is due to internal factors or is imported from the international market (Byerlee *et al.*, 2005).

We shall begin by presenting the different strategies that may be used to reduce price instability or mitigate its consequences (chapter 1), then enter more into the details of the instruments that can be employed to implement these strategies (chapter 2).

1. Developing a strategy to manage food price instability

We will begin by presenting a panorama of the different strategies that may be used to manage food price instability (1.1.). To do this, we firstly propose a taxonomy based on two criteria: the goal – reducing price instability or mitigating its effects – and the means adopted to reach this goal – based on markets or public interventions. Building on this, we will then identify four “pure” strategies (called A, B, C and D) that can be combined (1.1.1.). This “ABCD framework” will be used repeatedly throughout the book to review the options possible, describe their advantages, limitations and perverse effects, and the instruments with which they are associated. It will allow us to provide a considerably simplified presentation of the literature that has analyzed the properties of many instruments. This framework will first be used to present a brief historical account of the debates and controversies that have surrounded the management of agricultural and food price instability (1.1.2.).

We will then focus on the controversy that currently opposes approaches based on mitigating the effects of price instability and those that aim to reduce price instability (1.2.). We first consider the option that has predominated since the 1980s, and whose aim is to reduce the effect of price instability “without touching prices” (1.2.1.). This may be considered as a “mixed” strategy combining the two “pure” B and D strategies and we have dubbed it the “optimal strategy” as it claims to provide an optimal economic solution to the price instability problem. This strategy unfortunately failed to live up to its great expectations (1.2.2.). It failed when put to the test and today is widely viewed as a disappointment. This failure of the optimal strategy leads us to ask whether an alternative strategy is possible (1.2.3.). We begin by presenting the objections to price stabilization and at this point gain the impression that we have reached a dead end. Does failure of the optimal strategy and the apparent impossibility of finding an alternative strategy condemn us to live with unstable food prices and suffer all the consequences (namely food insecurity and a halt to green revolutions)? An examination of the different causes of price instability nevertheless allows us to make some progress for, in the light of these different causes, the criticism leveled against price stabilization appears to be ill founded and this rehabilitates price stabilization-based strategies.

This encourages us to analyze price stabilization-based strategies in detail (1.3), firstly by considering how the targets (intervention prices) of stabilization policies can be set (1.3.1.). The aim here of course is not to stabilize prices entirely as this would prevent the market from operating. Stabilization must simply aim to prevent prices from reaching extremely low or high values. These "extreme" values may be decided by an approach that is either technical (notion of "abnormal" price) or political (notion of "unacceptable" price for a given society). We then address the question of price stabilization methods (1.3.2.). A multitude of instruments are available for this based either on an improvement in the market (A strategy) or public interventions (C strategy). Should only A-instruments be used, or is recourse to C-instruments also necessary? We begin by establishing that the effectiveness of stabilization strategies depends on the main cause of the price instability. We then analyze successively the different strategies that can be employed in situations of "natural", "imported" and "endogenous" instability. Finally, considering the difficulties arising from the multiple causes of price instability leads us to specify the different pillars on which the price stabilization schemes must rest (1.3.3.).

We then broaden our analysis, for although price stabilization is an essential component in the management of food price instability, it alone is insufficient (1.4.). We therefore present the policies that necessarily must accompany this stabilization, based on public (1.4.1) or private instruments (1.4.2.).

We then study in detail the concrete conditions for implementing food price instability management schemes (1.5.). We discuss the most relevant scale on which the scheme may be implemented, in particular the expected benefits of regional schemes (1.5.1.). We then determine how the scheme can be adapted to match the specificities of each country or group of countries (1.5.2.). Finally, we show that the success of price instability management schemes depends greatly on the manner in which they are designed and implemented, and this leads us to put forward a few guiding principles that guarantee good governance (1.5.3.).

We wind up by discussing the role the international community should play in managing food price instability (1.6.).

1.1. Panorama of the different possible strategies that may be used to manage food price instability

1.1.1. The ABCD framework

As mentioned in the introduction, it is because food price instability causes instability in incomes and purchasing power that it generates such a host of development problems: food insecurity, a lack of investment in food production, macroeconomic instability, and even political unrest.

The problem of price instability may therefore be resolved by two non-exclusive approaches. The first consists in stabilizing prices. The second consists in reducing the effects of price instability on income and purchasing power.

Each of these approaches can be implemented either by developing markets or by using public interventions.

We therefore propose to distinguish between four possible strategies by examining their goal – stabilize prices or reduce the effects of instability – and the means adopted to reach this goal – market development or use of public interventions (see table 1).

Table 1 *The different strategies for managing price instability*

		Goal	
		Stabilize prices	Reduce the effects of price instability
Means	Market development	Strategy A	Strategy B
	Public interventions	Strategy C	Strategy D

Source: author.

Strategy A consists in making production, trade and consumption more responsive to prices such that low magnitude price movements are sufficient to correct disequilibria. For instance, if prices rise a little but producers increase their production (more land sown, more use of inputs), the rise will be limited. If, in addition, production is rendered less susceptible to climatic hazards, the relationship between price and production is strengthened. Likewise, if traders take advantage of price differences between localities by buying where prices are falling and selling where they are rising, this both limits price drops in regions where the supply is too great and limits rises in those where it

is insufficient. The same can be said of price differences over time: by making use of storage, producers and traders can use good-year surpluses to compensate for poor-year deficits.

The instruments associated with strategy A (or A-instruments) aim to facilitate *arbitrage* by market actors (producers, traders, processors, consumers). This arbitrage may be made in time (choice of time to buy and sell), in space (choice of where to buy and sell), between products (choice by producers to allocate their plots, choice by households to consume) and between production techniques (choice by producers of methods that are more or less intensive, resulting in more or less sensitivity to natural hazards). As these decisions are based on prices, the first step in their facilitation is to inform market actors of price movements: this is the role of Market Information Systems (MIS). But information is often not enough. For example, a farmer may be looking to intensify his production but is unable to do so if he lacks the means to purchase fertilizer or has little access to credit. A trader may be looking to buy in one locality and sell in another, but is unable to do so because he lacks any means of transport. A-instruments can therefore be split into two major categories: *provision of inputs for agricultural production* (fertilizers, pesticides, irrigation services, seeds, equipment, credit, advice, etc.) and *market infrastructure and institutions* (means of transport, communication, processing and storage, seasonal credit, grading systems, warehouse receipt systems, commodity exchanges, etc.).

Strategy B consists in enabling producers and traders to hedge price risk and correlated risks. This means that economic actors who hedge on the futures markets receive financial compensation if price movements cause them to lose money. The futures markets therefore provide a sort of insurance against price risk (even if they function very differently from insurance companies). Their aim is not to stabilize prices but simply to ensure that price instability does not generate income instability. As harvest risk sometimes correlates with price risk (when harvests are good the price falls, and *vice versa*), strategy B also includes hedging harvest risk.

B-instruments may therefore be split into three groups. The first two concern instruments used to hedge price risk and harvest risk. For instance, the futures markets offer different instruments, mainly futures, call options and put options, that hedge price risk. Crop insurance and weather-indexed insurance enable producers to protect their income from the negative consequences of natural hazards. It should also be noted that "mixed" instruments can be used to hedge both price risk and harvest risk. This is in particular the case for revenue insurance. These two groups of B-instruments provide *ex ante* protection. A third group of B-instruments enables actors to react

ex post, after their income has fallen due to a poor harvest or a price shock. These instruments concern producer or consumer credit.^[2]

Strategy C consists in public interventions to ensure that supply meets demand. Interventions may act on production, on stocks or on foreign trade.

C-instruments used to control production mainly take the form of input subsidies and production quotas. Instruments used to regulate foreign trade either take the form of taxes or subsidies and quantitative restrictions (quotas, bans or licenses) on imports or exports. Finally, C-instruments that impact on storage consist mainly of public stocks (buffer stocks managed directly by the State), though indirect forms of control over private stocks may also be envisaged and are used in certain countries.

Strategy D aims to support the income of households rendered food-insecure due to price rises. This support relies on public transfers that are generally restricted to high-price periods and target certain categories of households considered as vulnerable.

D-instruments may vary with the nature of the goods being transferred (cash, vouchers, food, inputs or assets), the target, the level of support (free distribution or simple subsidy, as in the case of moderately priced sales), the matching contribution required (this, if any, may take the form of work or a household's commitment to adopt certain behaviors, such as the schooling of children), and whether transfers are activated structurally (to recapitalize vulnerable households) or only in emergency situations.

1.1.2. Short account of past debates on managing the instability of agricultural prices

A great many papers (run through with lively controversy) have been published on how to manage the instability of agricultural prices.

For many years people turned to C-instruments in their efforts to find a solution to the price instability problem. After World War II, leading economists (including Keynes) recommended that mechanisms should be set up to stabilize international prices. This was translated into action by the signing of several "International Commodity Agreements" (ICAs) that aimed to stabilize the price of sugar (1954), coffee (1962), cacao (1972) and natural rubber (1980). The heyday of this drive to stabilize prices

[2] It should be noted that credit is part of both A- and B-instruments. It helps producers, traders and consumers to arbitrate as it provides them with the capacity to respond to price movements, but it also helps economic actors maintain their production or consumption levels even when their income falls.

1. Developing a strategy to manage food price instability

was reached in 1976 with the Integrated Program for Commodities proposed by the United Nations Conference on Trade and Development (UNCTAD) which aimed to build a “new international economic order” by stabilizing the price of ten major commodities. But, during the 1980s, the beneficial effect of price stabilization was contested by academics (Newbery and Stiglitz, 1981) and policy makers gradually abandoned price stabilization mechanisms (Gilbert, 1996).^[3]

The spotlight has ever since been focused on B-instruments, with the idea predominating that the stabilization of agricultural prices is not a good thing, for two reasons. First, it prevents prices from playing their role of signals that are supposed to guide production and trade behaviors. Second, by uncoupling price movements from production movements it prevents farmers from benefiting from the “natural insurance” procured by the negative correlation between price and harvest volumes. The best option, therefore, was considered to consist in stabilizing incomes without “touching prices” by using private risk hedging instruments (B-instruments), supplemented (in the case of staple food crops) by safety nets for vulnerable populations (D-instruments). But the expected boom in risk hedging instruments (B-instruments) failed to materialize despite initiatives taken to promote their use by farmers, traders and even DC States (CRMG, 2008). And D-instruments sometimes proved unable to prevent the situation of the poorest households from worsening (as shown by the 2005 crisis in Niger).

This led to A-instruments being brought to the fore (Byerlee *et al*, 2005) with the idea that grain market modernization could in part be the solution.

Finally, the 2007-2008 food crisis led to C-instruments re-gaining a certain legitimacy as illustrated by International Food Policy Research Institute (IFPRI) and World Bank proposals to stabilize grain prices on international markets (Von Braun and Torero, 2008, 2009a and 2009b; Lin, 2008; Von Braun *et al*, 2009).

1.2. The current controversy: reduce the effects of price instability or stabilize prices

The current controversy pits approaches that seek to reduce the negative consequences of price instability against those that recommend proactive measures to reduce price instability. The first have given rise to a mixed strategy based on strategies B and D.

[3] The only ICA stabilization scheme that survives today is that designed to stabilize the price of natural rubber.

We have dubbed this the “optimal strategy” as it claims to bring an optimal economic solution to the price instability problem. We will begin by describing this “optimal strategy” (1.2.1), before showing that it has very largely failed in DCs (1.2.2). This will then lead us to analyze whether an alternative strategy based on a reduction in price instability is possible or not (1.2.3).

1.2.1. The “optimal strategy”: stabilize income “without touching prices”

The “optimal strategy” was the dominant approach (both in academic and political circles) from the end of the 1980s until the crises that occurred in the second half of the 2000s. It still today constitutes the principal reference paradigm for international organizations. Its main message is that it is preferable to treat the consequences of price instability without stopping prices from fluctuating. This means that B- and D-instruments should be employed rather than A- and C-instruments.

The optimal strategy relies primarily on *B-instruments*, i.e. instruments that hedge price risk and harvest risk. Most of these instruments are based on the notion of compensation: economic actors protect themselves by acquiring contracts that provide cover with regard to a particular variable that can be price (*futures*, call options, put options), harvest (crop insurance), climatic conditions (weather-indexed insurance) or revenue (revenue insurance). If the variable covered in the contract exceeds a certain threshold, the contract holders are granted financial compensation.^[4]

The protection afforded by this set of instruments has characteristics that appear to bring an “optimal” solution to price and harvest instability.

Firstly, it is *symmetrical*: B-instruments can protect against both excessive drops and rises in prices. For example, producers can use *futures* or put options to hedge against income losses arising from price drops. Likewise, purchasers can protect themselves from price rises through recourse to *futures* or call options.

Secondly, it is *flexible*. Economic actors can be offered a full range of contracts (options, insurance) providing different levels of protection. This allows actors who are little risk averse to cover themselves moderately while leaving others the possibility to acquire greater protection (by paying more). Price stabilization cannot offer such flexibility for it generates the same level of protection for all.

[4] Some B-instruments are based on other notions such as risk pooling (see 2.2.)

Finally, it is *predictable*. The level of protection offered by most B-instruments is known in advance. For example, a producer in possession of a put option knows that selling will bring him at least the floor price guaranteed by the option.

These three characteristics are not the exclusive prerogative of B-instruments, but for each of these characteristics, B-instruments do have an undeniable comparative advantage.^[5] Symmetry, flexibility and predictability: it is easy to see why so much hope was placed in B-instruments and why so many researchers saw them as the "optimal" solution to the price instability problem.

But better still, thanks to the different complementarities between B-instruments, the set of B-instruments provides great consistency. These complementarities come into play between instruments that hedge different risks (namely those that protect against harvest risk and those that protect against price risk). They also unite instruments that afford *ex ante* protection (by guaranteeing financial compensation in the event of a poor harvest or unfavorable price movements, e.g. crop insurance or *futures*) and those that intervene *ex post* (credit helping market actors respond when faced with a fall in income). In this regard, actors who have price risk or harvest risk cover find it easier to obtain credit from banks or microfinance institutions. Finally, B-instruments are also *complementary in scale*. If the risks run by actors in a given area are correlated (for instance the risk of a poor harvest) the actors supplying them with B-instruments (insurance companies, credit institutions, etc.) themselves run a risk... that they pass on to their customers. This has the effect of increasing the cost of B-instruments. But these B-instruments providers may in turn use B-instruments to protect themselves. For example, a company that provides the farmers in a particular area with crop insurance or microcredit can protect itself with weather-indexed insurance (this type of insurance may be offered by a company that operates over a

[5] For instance, D-instruments are not *symmetrical*: they focus more on dealing with increases in food prices than on decreases. Likewise, A-instruments are not entirely symmetrical in the sense that they are better at managing price decreases than increases, for private storage is better at absorbing surpluses than making up for deficits (Williams and Wright, 1991). The advantage of B-instruments is very clearly their *flexibility*. By stabilizing prices, A-instruments and C-instruments provide everyone with the same level of protection. D-instruments can provide different levels of protection depending on household characteristics, but here the level of protection is not chosen by the households themselves (unless self-targeting is used). Finally, with regard to *predictability*, here again B-instruments are best. A-instruments do not provide any guaranteed price. And given that most D-instruments are used only in crisis situations (and with *ad hoc* targeting), no vulnerable households in need can be absolutely certain in advance of receiving the social transfers D-instruments provide. C-instruments can provide an appropriate level of predictability on condition that public interventions are governed by rules, with interventions being triggered only if prices reach certain pre-defined thresholds (see 1.5.3.). Generally, the symmetry, flexibility and predictability of all instrument categories can be enhanced by appropriate means, and this is one of the conditions for improving their effectiveness (see 2.).

larger geographic area, meaning that it diversifies the weather risks). In the same manner, traders can protect themselves by using the futures market to purchase from producers at prices that are agreed in advance. This provides producers indirectly with the protection afforded by futures markets.

Given these complementarities, B-instruments would appear to constitute an appealing solution to the price instability problem. If we add to this the fact that these instruments are symmetrical, flexible and predictable, it is easy to understand why B-instruments have fascinated, and continue to fascinate, both researchers and policy makers.

Yet, when ranged against the price instability affecting basic foodstuffs, B-instruments are not enough. For many years, the debate surrounding price instability focused on cash crops or mining products (coffee, cacao, rubber, tin, etc.). In this context, the "optimal" strategy relied solely on B-instruments. The shift in focus to food prices led to the consideration of D-instruments as it was obvious that vulnerable populations in DCs did not have the means to use B-instruments to hedge harvest risk and price risk. It was therefore necessary to offer them cost-free instruments able to play the same protective role as B-instruments: *i.e.* D-instruments.

D-instruments aim to transfer goods to certain household or person categories. They differ by: a) the nature of the goods transferred, b) the nature of the matching contribution (if any) c) the target beneficiary and d) the structural or conjunctural character of the transfer. The goods transferred may take the form of food or cash, food vouchers, agricultural inputs or assets (such as cattle). The matching contribution may be work, cash (if the transferred goods are only partly subsidized, not distributed for free) or the household's commitment to adopt specific behaviors (for instance the schooling of children). Targeting may rely on a wide variety of methods. A particularly interesting method is "self-targeting" that consists in creating conditions such that only households requiring aid actually ask for it.^[6] Finally, aid may be structural or may be activated only in periods of crisis (if the harvest is poor or if food prices rise substantially). A large number of instruments can be obtained by crossing the different modalities of the four dimensions.

[6] If, for example, grain provided as food aid is of a low quality, or if considerable queuing or work is required to obtain it, only households truly in need of the aid will be willing to make the effort necessary (for more details see 2.4).

When the optimal strategy was still predominant, D-instruments were viewed in the same light as B-instruments, *i.e.* protecting economic agents from harvest and price risks, without “touching prices”.

Is the consistency of the “optimal strategy” strengthened or weakened by including D-instruments? Several factors point to it being strengthened. B-instruments and D-instruments appear to be *complementary*. Firstly, they are designed for different actors. Secondly, they match risks that have different characteristics.

B-instruments are more aimed at producers and traders whereas D-instruments are more intended for consumers. However, the distribution of roles between the two instrument categories should be viewed with caution given that the distinction between producer and consumer is rather fuzzy in DCs (many grain-producing households face deficits and must purchase grain during the lean period). Also, *actors with access to B-instruments are generally well off economic actors* (or at least medium sized), whereas *those targeted by D-instruments are poor, vulnerable households*. This again should be considered with caution for certain poor households may have access to certain B-instruments (such as microcredit). Likewise, operating difficulties in the targeting may result in non-poor households receiving transfers from D-instruments. But overall, B-instruments target the richest and D-instruments the poorest.

In addition, *B-instruments and D-instruments are not relevant in the same situations.* B-instruments can only be used efficiently in the face of risks that follow known statistical distributions. When this is not the case, insurers run a very high risk. This is why recourse to public safety nets is necessary in situations of “wild” (high and non-probabilizable) risk (Cordier and Debar, 2004).

In all, the “optimal strategy” offers an extremely interesting combination of instruments. B-instruments combine the advantages of symmetry, flexibility and predictability. They are linked one to the other by different complementarities based on the type of risk covered (harvest risk or price risk), the point at which they intervene in the risk chain (*ex ante* mitigation or *ex post* reaction) and the scale of the intervention. With respect to staple food products, the mechanism must be supplemented by safety nets and other D-instruments for poor households and “wild” (non probabilizable) risk situations.

Also, beyond those directly afforded their protection, all market actors are liable to benefit from B-instruments and D-instruments. This “multiplier effect” is caused by the supposed knock-on effect exerted by these instruments on A-instruments: the protection afforded by B-instruments and, to a certain extent by D-instruments makes

private actors more secure and thus encourages them to invest in production and storage. This generally has a stabilizing effect on prices. Therefore, were a sufficiently large proportion of producers or traders to be afforded protection by B-instruments and D-instruments, this would cause prices to be less unstable, which would be beneficial for all.

For all these reasons, the “optimal strategy” has fascinated, and continues to fascinate, both academics and decision-makers. The general feeling is that *it should work*. Yet, with time, doubt started to creep in.

1.2.2. Failure of the “optimal strategy”

With the liberalization of agriculture and the dismantling of International Commodity Agreements (ICAs), many people thought that the futures markets and insurance markets would experience unprecedented growth. Others on the other hand rapidly expressed their skepticism of B-instruments, claiming that their development would be undermined from within by problems of adverse selection and moral hazard (Newbery and Stiglitz, 1981). Use of the futures markets would also be limited by the technicity and cost of the instruments proposed (futures, call or put options). Many nevertheless believed that these problems could be overcome, with a solution in part being found in the development of new instruments. For instance, weather insurance is less subject to problems of moral hazard than is crop insurance. A solution was also sought in the complementarities between instruments, and in particular between weather or crop insurance and price-risk hedging instruments, as well as between these two groups of instruments and credit. More recently, complementarities of scale have taken centre stage (Larson *et al.*, 1998). The idea here is that the problems of moral hazard, adverse selection and systemic risk can, in part, be resolved by B-instrument providers protecting themselves through B-instruments offered by actors operating on a larger scale. Public support was also envisaged in the form of technical support and sometimes subsidies (see actions by the World Bank’s Commodity Risk Management Group, CRMG, 2008).

The facts nevertheless proved the skeptics to be right. The much anticipated development of risk hedging instruments never materialized and the action taken has so far failed to stimulate the development of B-instruments or boost their use by DC producers and traders, at least as far as food products are concerned. Neither the development of new instruments, nor the emergence of new actors pooling risks and providing reinsurance, or multi-faceted support from public authorities, has led to any real growth in the use of B-instruments. However, it should not be concluded that these instruments are without potential. Efforts made to develop B-instruments

and stimulate their use by DC actors must continue. But let us be under no illusion. In DCs, the proportion of private actors with access to B-instruments will remain low. Other solutions must therefore be envisaged.

At the same time, D-instruments are also in crisis as revealed by the 2005 crisis in Sahelian countries, particularly Niger. Here, analyses showed that the price and production shocks experienced by households were not much greater than those of previous years. The malnutrition problems observed were mainly due to the fact that households whose capital had been reduced by a series of crises had little capacity to react. And this is precisely the criticism leveled at D-instruments: their failure to prevent the decapitalization and weakening of vulnerable households' resilience (Michiels *et al.*, 2008; Michiels and Egg, 2008; Blein and Egg, 2009).

The absence of any significant development in B-instruments, and the crisis in D-instruments, meant that the very rationale behind the optimal strategy (founded on risk and crisis management) is called into question. This strategy has been unable to guarantee the food security of poor households. It has failed to reduce the risk faced by producers sufficiently to stimulate their investment and thus modernize DC agricultures. Also, looking back into the past, not one single example can be found of a green revolution being stimulated by B-instruments. By contrast, the green revolutions achieved in European, North-American and Asian countries were nearly in all cases accompanied and facilitated by price stabilization schemes. This applies for instance to England and its corn laws, Europe and its Common Agricultural Policy (CAP) and the green revolutions in India (Dorin and Landy, 2009) and Indonesia (Timmer, 1997a).

An alternative strategy based on price stabilization must therefore be considered. Yet, the poor development of B-instruments and the crisis in D-instruments are not sufficiently decisive arguments in favor of this alternative strategy. We might think (and some do) that living with unstable prices and very imperfect risk hedging instruments is preferable to price stabilization. We must therefore step beyond simply noting the failure of B-instruments and D-instruments, and analyze the arguments against price stabilization.

1.2.3. *Is an alternative strategy possible?*

Objections to price stabilization

The informational role of prices and the "natural insurance" of producers are the main arguments given against price stabilization.

Prices as signals. It has long been known that prices aggregate information on the scarcity of goods. They therefore guide economic actors (Hayek, 1945). "Touching prices" therefore means reducing the quality of resource allocation.

"Natural insurance" of producers. Agricultural price stabilization has an uncertain effect on the instability of producer revenues since the negative correlation between harvest volume and price level (when harvests are poor, prices are supposed to be high) provides producers with a sort of "natural insurance" (price and production risks partially offset one another). Newbery and Stiglitz (1981) made this "natural insurance" aspect a central theme of their arguments. As stabilizing food prices generally means reducing the correlation between prices and harvests, this may ultimately increase the instability of producer revenues (Newbery and Stiglitz, 1984).

These arguments are nevertheless highly debatable and their validity depends on the causes of the price instability. We will therefore begin by describing these causes before returning to discussions on the relevance of a strategy based on price stabilization.

The necessary consideration of the causes of price instability

We propose to distinguish between three types of instability^[7] according to their causes:

"Natural" instability. This is the type of instability considered (sometimes implicitly) in most analyses. We have chosen to call it "natural" as it results from natural factors that affect harvest date and size. It in fact covers two types of rather different phenomena: seasonality and production variability.

Seasonality is related to the fact that harvests are concentrated in time. As new harvest produce arrives on the market, the price falls then gradually increases during the

[7] There is also a fourth cause of instability: instability arising from markets for products linked to food products (inputs or substitutable products). This mainly concerns oil and other energy products whose price affects food production costs through effects on the cost of fertilizer, the cost of pumping water, or transport costs. Thanks to the growth in biofuels, energy products have also become partially substitutable with food products (Vouriez, 2009b; Hertel and Beckman, 2010; Roberts and Schlenker, 2010; Tyner, 2010). Energy price instability may therefore lead to food price instability. However, the passing on of instability through production costs would appear empirically to have only a minor effect on food price instability in DCs. And regarding biofuels, if we exclude the case of sugar in Brazil, the main food products employed come from developed countries (maize in the USA, rapeseed in Europe). Biofuels therefore mainly destabilize prices in DCs not directly but through their effects on international prices. This effect is therefore captured by one of our three cause categories: imported instability. Some experts consider that given the financialization of agricultural commodity futures markets, agricultural prices may be affected by price fluctuations in other commodities (such as metals) or even securities. But here again, should such effects occur, they will affect prices in DCs only indirectly through their effect on international prices. It is for the above reasons that the fourth cause category has not been explicitly included in this sub-section (devoted to the causes of price instability in DCs). By contrast, it is discussed in the section devoted to the stabilization of international prices (see 1.6.2.).

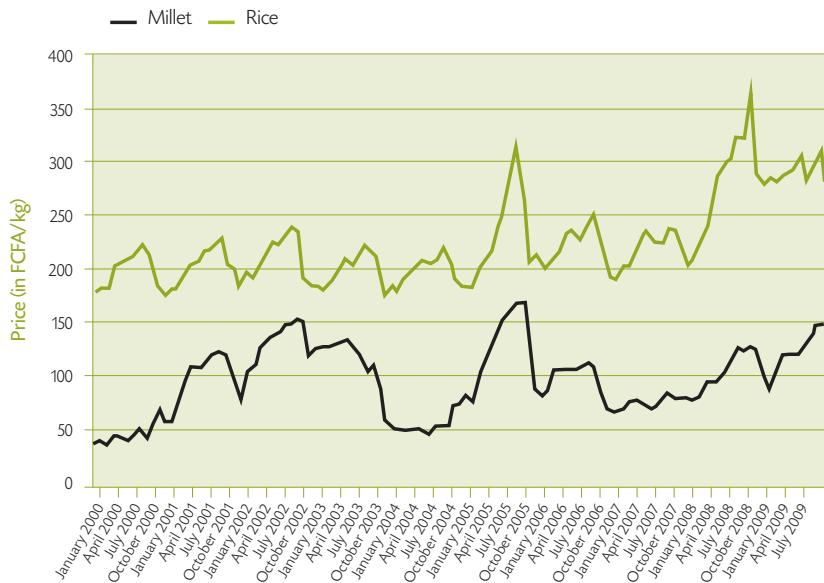
1. Developing a strategy to manage food price instability

year (as stocks fall) to reach a peak in the period immediately before the next harvest (the "lean season").

Production variability from one year to the next results from natural hazards (climate, disease or attacks by pests). This variability of course depends on the intensity of these climate hazards, but also on production sensitivity to these hazards (sensitivity that can be reduced to a certain extent for example by drought-resistant varieties, the development of irrigation systems or the use of phytosanitary products).

An important difference between seasonality and production variability is that the latter generates relatively unpredictable price instability (unlike the former that occurs cyclically). The two phenomena may nevertheless interact, with production variability in certain years offsetting seasonality. A comparison of producer prices for rice (mostly irrigated) and millet in Mali is in this regard most illustrative (see figure 4).

Figure 4 *Rice and millet producer prices in Mali (2000-2009)*



Source: Observatoire du Marché Agricole.

“Imported” instability. Price instability within a country may also result from its foreign trade since domestic prices are bounded by the prices that can be obtained on the international market. The import parity price (P_M) designates the cost price of grain imported onto the domestic market. This is therefore the international CIF (Cost – Insurance – Freight) price converted into national currency plus import tariffs and transport costs from the port to the domestic market. The domestic price cannot rise above the import parity price, for if it does, the country will be flooded by imports. A symmetrical situation is encountered for the export parity price (P_X): domestic prices cannot fall lower than the P_X for in this case traders export massively, stocks fall and the domestic price is held at the P_X . The domestic price is therefore held within a band bounded by the parity prices.

Variability in the import parity price (P_M) or export parity price (P_X) can therefore cause price instability on the domestic market. This variability in parity prices in turn stems from variability in international prices, but also other causes such as variability in exchange rates, the cost of ocean freight and the cost of shipping goods from the port to the domestic market.

“Endogenous” instability. Price instability is referred to as endogenous when it arises from the functioning of the markets themselves, not from exogenous shocks such as those affecting production (Boussard, 1996; Boussard *et al.*, 2006).

In this case, price instability results from the interplay between expectations and behaviors. It is well known, for instance, that most decisions by economic actors are taken on the basis of their expectations for future prices. This is obviously the case for production decisions (choice of land area allocated to different crops and amount of inputs employed), given the time lag between these decisions and harvesting. But this is also the case for buying and selling decisions. If expectations are based on past price movements, this may lead to endogenous instability given that the instability of the expectations leads to unstable behaviors which lead to price instability that further accentuates the instability of the expectations.

A famous example of this is the *cobweb scenario*, shown by Ezekiel (1938). In its simplest version, the cobweb mechanism supposes that the expected price is equal to the current price. Here, if P_t is high, many producers increase the areas sown or intensify their production, thereby lowering P_{t+1} , discouraging production and in turn causing P_{t+2} to be high. It may be said that the mechanism described by Ezekiel is unlikely to occur as it is based on the hypothesis of “naïve” expectations: economic actors are assumed to believe that tomorrow’s price will be more or less the same as today’s.

But other researchers have shown that the cobweb mechanism also comes into play with less naive expectations, on condition that they are based on past price movements (Nerlove, 1958). The root cause of the cobweb is the “simultaneous” nature of production decisions: when a farmer sows maize he does not know what decisions are being made by other producers in terms of areas sown with maize or the amount of inputs used as, given the proximity of sowing dates and production lags, when some farmers are sowing, others have not yet sold their harvest. Current prices cannot therefore reveal to some farmers the production decisions taken by others.^[8]

Another scenario is that of speculative bubbles and panics. If market actors expect prices to rise, they have every interest in holding on to their stocks and increasing their buying, actions which cause prices to rise (self-fulfilling predictions). The phenomenon may snowball: expecting prices to rise actually causes real price rises which further feed price rise expectations. This is the mechanism behind “speculative bubbles” where price movements are disconnected from fundamental dynamics, until the market “bursts”. Panics have a similar mechanism: the fear of running short drives consumers to increase their buying, which can cause a real shortage. Panics may also occur in the other direction, with economic actors seeking to sell rapidly a product whose price is collapsing (and thereby further depressing the price). Although speculative bubbles and panics may occur both on physical markets and on derivative markets, their likelihood is greater on the latter.^[9]

Endogenous instability therefore takes two fairly different forms. Whereas the cobweb mainly concerns production behaviors, speculation and panics mainly concern trade behaviors for either futures contracts or physical products (stock retention by traders, massive purchasing by consumers to build up stocks for precautionary reasons). Another difference is that the cobweb tends to generate a negative price autocorrelation (a high price at t tends to result in a low price at t+1 and *vice versa*), whereas speculative bubbles and panics have the opposite effect (a price rise in t tends to cause a fresh rise in t+1).

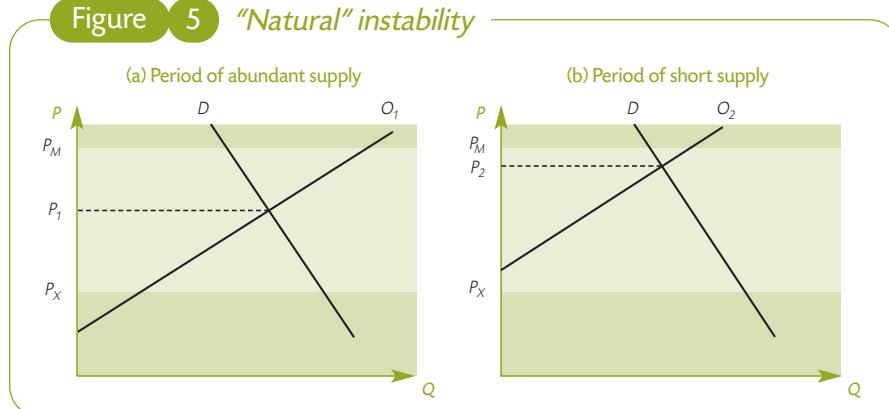
[8] In the original version of Ezekiel's paper, and in the work that followed, the cobweb concerned only production decisions. However, the mechanism involved seems to have a more general scope. Let us consider trader choices concerning which areas to buy from. These traders have a choice between different rural markets and make this choice based on expected prices for the next market day. If expectations are based on the price on the last market day, then cobweb dynamics may well emerge as many traders will turn up at the market where the price was lowest, thus causing demand and therefore prices to soar.

[9] This is due to the fact that the price of futures on futures markets is an aggregate of all expectations for the price in the future. It is therefore perfectly rational for economic actors to revise their expectations based on changes in this price. Therefore, as a rise in the price of futures means that most actors expect the price to rise, actors who think otherwise will tend to change their minds and also expect a rise, and therefore buy futures. This in turn will cause a fresh rise.

The differences between the three types of instability^[10] can be more clearly understood if represented graphically.

Natural instability may be represented by a *shift in the supply curve* (see figure 5). *Seasonality* may be represented by a gradual slide in the supply curve: located at O_1 immediately post-harvest, it gradually shifts leftward to reach O_2 in the period immediately before the next harvest, which causes the price to increase from P_1 to P_2 (until new harvests shift the supply curve to the right and cause prices to fall). Regarding *production variability*, this may be represented by the fact that during the harvest the supply curve is randomly located between O_1 and O_2 (depending on natural hazards affecting the plants), which leads prices to be randomly located between P_1 and P_2 .

Figure 5 "Natural" instability

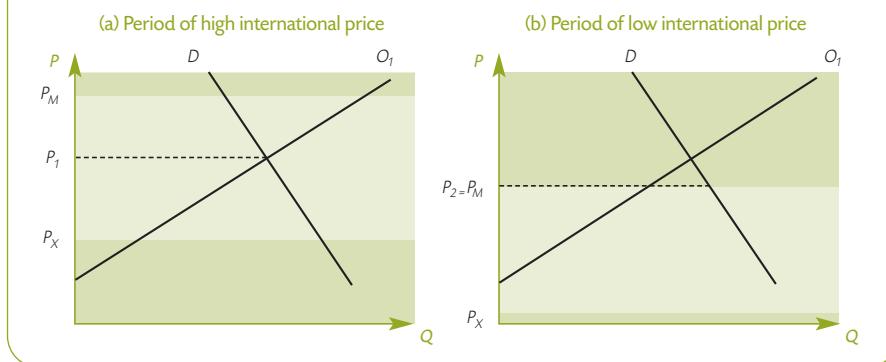


Source: author.

[10] It should be specified that, in this book, each time we deal with price instability *inside DCs*, natural instability and endogenous instability refer *solely to internal factors*. Thus, natural instability or the cobweb refers only to that country's production. Likewise, speculative bubbles refer to the selling and buying behavior of economic actors (producers, traders, processors and consumers) in that country. Imported instability on the other hand refers to instability derived from international markets, regardless of whether this is caused by weather hazards, speculative bubbles, the cobweb, panics or energy price instability (see footnote 6). This distinction is justified from an operational standpoint: although a country can tackle internal (natural and endogenous) causes of instability, it has no control over external causes (it can only attempt to protect itself from imported instability, and in doing so lends little importance to the causes of this instability). By contrast, on the international scale, any price stabilization strategy must address the causes of international price instability (see 1.6.2).

Imported instability may be represented by an upward or downward shift in the band established by the parity prices (see figure 6). In the example shown, the country is disconnected from the international market when the international price is high (case a), but becomes an importer when the international price is low (case b). This causes the domestic price to fall to the import parity price. Other situations are possible. For instance, the country becomes an exporter when the international price rises (here domestic price rises to P_X). The country may also structurally be an importer (or exporter), and domestic prices in this case fluctuate with variations in P_M (or P_X).

Figure 6 “Imported” instability



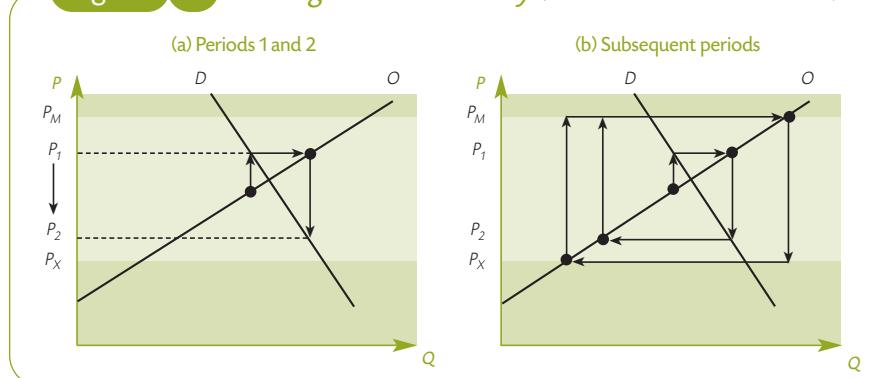
Source: author.

Endogenous instability may be represented by a shift along the supply or demand curves (see figure 7). Prices in this case fluctuate not because of exogenous shocks but because of the dynamics of the domestic markets, particularly the interplay between price expectations and production or trade behaviors. This may generate cobweb dynamics, speculative bubbles or panics that result in erratic shifts along the supply or demand curves.

Let us consider the case of the cobweb in its most simple form, as represented in figure 7. During the first period the production level causes the price to settle at P_1 with supply and demand in equilibrium. Given that producers expect the price to stay at this level, production decisions for the next period are taken in view of P_1 . But at this price demand is unable to absorb all the supply so that *ex post* the price falls to P_2 . New production decisions are based on this price. Production therefore falls and prices rise. Alternating high and low productions over the following periods

cause price instability. Here it should be noted that it is the parity price band that bounds price and production instability (see figure 7b).

Figure 7 “Endogenous” instability (the case of the cobweb)



Source: author.

Empirical examples can be provided for each of the above causes. The Sahel crises of the 1970s were mainly due to poor harvests caused by drought (natural instability). The 2008 price crisis that affected many developing countries resulted from soaring international prices (imported instability). According to Amartya Sen, the famine that affected Bengal in 1943 can mainly be explained by speculative dynamics, and, for him, this is also the case for most famines (Sen 1977, 1980, 1981a and 1981b).^[11] According to Ravallion (1987), the famine that occurred in India in 1974 was the result of a panic stemming from erroneous expectations that caused the panic-buying of stocks, creating a real shortage (endogenous instability).

The different causes of price instability may of course work together simultaneously, which further complicates the problem. For example, the harvest may be poor (making the country deficient) at the same time that international prices rise, causing domestic prices to soar. Likewise, the cobweb or speculative bubbles may be fed by instability in harvests, international prices or exchange rates. For instance, the 2005 crisis in Sahelian countries was very likely due both to the cobweb (producer prices were low the pre-

[11] Sen's analysis has been contested by certain experts (both as regards the causes of famines in general and the specific case of Bengal). This gave rise to a controversy in Food Policy (Bowbrick, 1986 and 1987; Sen, 1986 and 1987).

vious year) and attacks by locusts (natural instability). Later in this book we will examine in depth how to manage instability stemming from a combination of causes.

Now that we have looked at the causes of price instability we can discuss the arguments advanced against stabilization and contest their validity. This will lead us to rehabilitate price stabilization-based strategies.

Rehabilitating price stabilization-based strategies

Although the optimal strategy has been predominant since the 1980s, it has poorly withstood the test of time: the much anticipated development of B-instruments never materialized and D-instruments failed to prevent the nutritional situation of many vulnerable households in developing countries from further deteriorating.

But should an alternative strategy based on price stabilization nevertheless be envisaged? Criticism has been leveled at the notion of price stabilization, but, as we will now see, the theoretical foundations of this criticism are shaky if we consider the different causes of price instability. We may therefore call into question the idea of not "touching prices" to avoid disturbing market signals and the idea that price stabilization would have little effect on farmers' revenue instability due to the natural insurance provided by the negative correlation between price and production.

The informational role of prices with regard to endogenous instability and imperfect expectations

It has long been known that prices guide the behavior of economic actors (Hayek, 1945). Stabilizing prices therefore means they are prevented from correctly fulfilling their informational (and incentive) role.

However, this is only true if price movements correctly reflect changing fundamentals. And we know that this is not always the case. Markets are not always informationally efficient. First, during speculative bubbles and panics, price movements considerably amplify changes in fundamentals. Second, in cobweb dynamics, the information conveyed by prices is not interpreted correctly, leading farmers to overreact to price movements. These situations refer to what we early called endogenous instability. Here, *prices do not convey the appropriate information to economic agents, they mislead them*. It seems therefore that prices should be stabilized in a manner that exactly removes the endogenous component *without touching the natural or imported price instability component*. Price stabilization therefore strengthens the informational role of the markets by ensuring that price movements match movements in fundamentals. This is the idea behind the mechanism put forward by IFPRI

to stabilize international prices (Von Braun and Torero, 2008). However, implementing this idea would be difficult as it requires determination of the "real price", i.e. the price on the market in the absence of any endogenous instability (it is this "real price" that must serve to determine the trigger thresholds for public intervention), and it is doubtless for this reason that the proposal has been revised by its authors (1.3.1).

Even in the absence of endogenous instability, price stabilization is still desirable as it improves the quality of expectations and, by so doing, the quality of production and storage decisions. It therefore may have a beneficial effect on resource allocation, even in the absence of endogenous instability.^[12] Price stabilization could therefore go beyond the point necessary to remove only the endogenous component of instability.

Controversial effects of natural insurance for producers

Natural insurance is based on the idea that as there is a negative correlation between price level and harvest volume, the price risk and the harvest risk in part offset one another. It therefore follows that price stabilization may further increase the instability of producer revenues (Newbery and Stiglitz, 1984). This means that the problem of price instability should be dealt with *without stabilizing prices*, and this is the core doctrine underlying the optimal strategy. To what extent does such "natural insurance" actually exist? Does it really benefit farmers?

Whether natural insurance exists or not depends greatly on the type of instability. In situations of imported instability, price changes on the domestic market are due to changes in the (import or export) parity price, which in turn depends on the international price, freight costs, and the exchange rate. It is therefore somewhat improbable that domestic prices correlate with the country's harvest volume (except for "big" countries – in the sense of the theory of international trade – whose production level affects the international price). In situations of panics and speculative bubbles, price instability is in no way linked to harvest instability, only to the variability of agent expectations. Here therefore there is no "natural insurance". When instability is due to the cobweb there is indeed a negative correlation between harvest volume and price level, but this does not stabilize farmers' income for the high production – that is supposed to compensate for the low price – is obtained through increased use of factors, raising costs. It is only in situations of *natural* instability that the price risk can be partly offset by a harvest risk. But even in this situation, the notion of

[12] In particular, if stabilization guarantees a floor price, it improves producer, trader and banker expectations and therefore stimulates investment (by making producers and traders more secure and facilitating their access to credit).

domestic prices being correlated to the harvest volumes of individual farmers is still improbable.

Moreover, even when it does exist, this “natural insurance” has diverse effects on farmers’ revenue. For deficit farmers, natural insurance works in reverse: when the harvest is poor (and prices therefore high) these producers have to buy large quantities on the market to feed their family! This is a real problem given that deficit farmers account for a very large proportion of all farmers in certain countries (more than 50% in many African countries and even 73% in Ethiopia, see Jayne *et al*, 2006).

The forgotten effects of price instability on consumers

Most cost-benefit analyses of price stabilization focus on *producers*. The main reference publications in this field assume that the products concerned account for only a very small proportion of consumer expenditures, and therefore that price instability does not affect them (Newbery and Stiglitz, 1981; Williams and Wright, 1991). This is due to the empirical background of these studies: international prices of tropical cash crops such as coffee, cacao or natural rubber for Newbery and Stiglitz and domestic price of grains in developed countries for Williams and Wright. By contrast, when the question of grain and other staple food products is considered in developing countries, the assumption is obviously unacceptable. For instance, in Mali it has been estimated that 64% of the household budget is devoted to food, and this rises to 77% in the poorest rural quintile (Bocoum, 2011). Expenditures devoted solely to grain are on average 18.4% of total budget for urban households and 34.9% for rural households. This rises to above 44% for the poorest rural households! Moreover, grain provides most of the calories in the diet, and this for all social categories. A large proportion of the Malian population is therefore affected by rises in grain prices, and this is particularly true given that incomes are very low: 72% of the Malian population lives on less than 2 USD daily, and 36% on less than 1 USD (Gérard *et al*, 2008).

In a such a situation where vulnerable households account for a large proportion of the population, *price stabilization may be more efficient than targeted aid*. This is due to difficulties encountered in targeting which can prove both costly and very imperfect (some vulnerable households being overlooked while some non-vulnerable households receive aid).

Table 2 *Proportion of grain in the diet and household expenditures in Mali (%)*

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

Source: Bocoum (2011).

We have seen that the arguments against price stabilization do not hold. This shows there is much to be gained from stabilizing prices, even considering the informational role of prices and natural insurance for producers. We must therefore, at this point, analyze in more detail the practical means by which prices can be stabilized.

1.3. How can prices be stabilized?

The first step consists in assigning the stabilization strategy a target (1.3.1), and here two approaches are possible. The first, technical in nature, is based on the notion of "abnormal" price, whereas the second, political approach, is based on the notion of "unacceptable" price. The second step consists in identifying relevant instruments (1.3.2). After first showing that instruments must be chosen in relation to the cause of price instability, we will go on to analyze which instruments are relevant in situations of "natural", "imported" and "endogenous" instability. The third step consists in combining the instruments within consistent schemes that can counter all the causes of price instability (1.3.3).

1.3.1. Setting stabilization targets

The ultimate aim of stabilization is to protect both consumers and producers and guarantee some degree of political and macroeconomic stability. With this aim in mind, what targets should be set?

The aim of course is not to stabilize prices entirely as this would prevent them from playing their informational role. It would also prevent the market from functioning and would lead to all adjustments being made by public intervention. The stabilization must therefore aim simply to prevent prices from reaching "extreme" values. But precisely how are these extreme values to be set? Two approaches are in principle possible. The first is technical and seeks to establish objectively the levels below and above which prices are deemed to be "abnormal". The other, political in nature, seeks to set the points below and above which a price becomes "unacceptable" for a given society.

The "technical" approach

The technical approach may be illustrated by the Jaochim Von Braun and Maximo Torero proposal. Considering that the 2008 crisis may largely be explained by a speculative bubble on food futures markets, these IFPRI researchers put forward a mechanism based on "virtual stocks" designed to dissuade such bubbles from forming and, if needed, counter them (Von Braun and Torero 2008 and 2009a) (see 1.6.2).

What interests us at this point is their stated aim of tackling only the formation of speculative bubbles. In other words, prices are left to fluctuate freely provided they reflect fundamentals. Interventions therefore aim only to maintain this connection with fundamentals by preventing speculative bubbles from forming. In this way, public interventions would allow prices to better play their informational role.

This is a very attractive but fairly conservative approach for it fails to address the problems stemming from natural and imported instability.

Above all, it runs into a practical difficulty: when determining intervention thresholds for the virtual stock (the "dynamic price band"), normal price movements (due to fundamentals) would have to be separated from "over-reactions" (due to speculative bubbles). To do this, the authors propose that a *global intelligence unit* should be set up. But this may not suffice, for if economists underline so strongly the fundamental role of price signals, it is precisely because of the great difficulty or even impossibility of calculating what "normal" price movements (due to fundamentals) should be.

Faced with these criticisms, the authors revised their proposal. The scheme now put forward is no longer based on the idea of removing the endogenous component of price instability (and thus of reconnecting prices to fundamentals). It now focuses on preventing prices from reaching “extreme values” (Von Braun and Torero, 2009b). The idea consists in estimating the stochastic process that generates price series and considering as “extreme” all price increases that have a less than 5% probability of occurring (Martins-Filho, *et al.* 2010). Although this renders the proposal more operational, the threshold appears to be rather arbitrary.

The “political” approach

Contrary to the technical approach, the political approach considers that intervention thresholds should depend upon collective values, aims and choices. Up to or down to what level is a rise or fall in price considered to be acceptable by a given country?

Technical criteria nevertheless continue to fulfill an important role in the political approach. Firstly, if the aim is stabilization (not income transfers between producers and consumers),^[13] prices should be stabilized around their mean value. The target value therefore should be the average price or, as put forward by Newbery and Stiglitz (1981, p. 32), “the price that conserves average quantity consumed”. Secondly, this target value must be updated to reflect the medium-term market trend. In particular, if the good is tradable, the target price should not be disconnected from the medium-term trend on international markets, otherwise it runs the risk of compromising the financial sustainability of the stabilization scheme (Guillaumont and Guillaumont, 1989; Timmer, 1997a). By contrast, if the target value is updated too quickly when the international price changes, the stabilizing scheme is no longer of any great advantage.^[14] Finally, the price band (around the target value) within which the price is allowed to fluctuate must not be too narrow, or the market cannot function (spatial and temporal arbitrage – through trade and storage – must remain possible). The challenge therefore consists in finding the appropriate balance between bands that are too broad or too narrow, too disconnected from or not sufficiently connected to international price movements.

[13] Stabilization policies have sometimes in the past been used as indirect means to support prices (case of international agreements on coffee and cacao), or tax producers (case of the *caisses de stabilisation* set up by many African exporting countries).

[14] As illustrated by experience gained with the international agreement on natural rubber (Gilbert, 1996).

Certain authors have put forward asymmetrical schemes as a solution: a floor price but no ceiling price (Coulter, 2005) or a ceiling price but no floor price (Von Braun and Torero, 2009b). The first is intended to avoid any crowding out of private stocks. It may, on the other hand, be imagined that a ceiling price is reassuring for producers and traders as they know that if the price rises too high, pressure from the street will oblige the State to intervene, but they do not know when that will happen. The existence of a ceiling price (announced in advance) is therefore likely to reduce the crowding-out effect, on condition that this ceiling price is set sufficiently high and is respected, *i.e.* the State does not intervene while the price remains below the ceiling. Those in favor of a ceiling price but no floor price focus on speculative bubbles and panics (that indeed do cause price rises). But other types of endogenous instability also cause excessive price collapses (cobweb). Therefore, symmetrical stabilization based on a price band is perfectly justified from a theoretical standpoint.

Also, it is often easier to implement from a political standpoint since it guarantees a certain balance between producers and consumers and thus provides a solution to the main food policies dilemma (Timmer *et al.*, 1983). Thus, when the State intervenes to prevent prices from falling too far, this is accepted by consumers since they know that the State will in turn protect them if prices soar. The fact that they are symmetrical and rules-based therefore lends stabilization policies a legitimacy that would always elude an asymmetrical or discretionary policy.

Price thresholds that trigger interventions must consider technical criteria (leave the market to play its role, consider limited budget resources), but the decision in the end is political. This decision reflects the price levels considered as unacceptable by a given society. Participative processes can be imagined to involve civil society actors in this decision (see box 16 on the Madagascar multi-stakeholders platform).

It is clearly the political approach that is the most pertinent at a national or regional scale for, when fixing price thresholds, countries have to make decisions that are clearly political in nature such as arbitrating between producers and consumers and between the short term and the long term. On an international scale the question is more open as the technical approach has the main advantage of providing a mechanical means of fixing and updating intervention prices. This considerably reduces transaction costs (which can be extremely high for international collective actions).

Once targets have been set in one manner or another, the question now arises as to which strategies and instruments should be used to reach them.

1.3.2. Choosing instruments based on the different causes of instability

A major feature of the literature is that the effectiveness of price stabilization instruments is usually discussed without any consideration of the cause(s) of price instability. But, a given instrument may have a stabilizing effect, a destabilizing effect, or no effect at all, depending on the type of instability it is facing.

Let us consider *the case of customs duties and other restrictions on international trade*.

If the instability is natural, free trade will have a stabilizing effect on international prices since deficits in certain countries will be compensated by surpluses in others, and thus the climatic risk is diversified on a planetary scale. On the other hand, if international prices are unstable because of the cobweb, free trade will have a destabilizing effect: it will cause the different national cobweb dynamics to synchronize (Boussard *et al.*, 2006).

On a national scale, doing away with customs duties will have a stabilizing effect if domestic price instability is primarily natural or endogenous for it will tighten the parity price band. By contrast, it will increase domestic price instability if this is primarily imported from the international market.

This leads to the idea that instruments must be chosen in relation to the type of instability. This idea is nothing new as the different causes of instability have gradually been elucidated over the years since the 16th century (Clément, 1999). For instance, various documents attest that the mercantilists were already acutely aware of the fact that speculation and panics could cause prices to soar. Boisguilbert, then the Physiocrats, had already analyzed certain forms of cobweb. But although different solutions were put forward to address these different problems, the idea did not emerge that solutions to one type of instability could have an amplifying effect on other types of instability. Galiani (1770) showed that a price stabilization instrument that works in one place may be harmful elsewhere, and *vice-versa*. But he did not link this role of the “context” with the causes of price instability.^[15] To the best of our knowledge, Ezekiel (1938) was the first to demonstrate that an instrument which is stabilizing when the instability is natural may be destabilizing if the instability is driven by cobweb dynamics. This theory was then practically “forgotten” in debates and

[15] The novelty of the contemporary approach is its discovery that what matters in the “context” are the causes of price instability plus a few other variables that restrict a country’s capacity to use instruments (see 1.5.2).

papers on price instability, with the notable exception of Jean-Marc Boussard whose work showed that certain instruments may have very different effects depending on whether the instability is natural or endogenous (Boussard *et al*, 2006; Boussard 2007). More recently the idea was put forward that a distinction must be made between natural instability and imported instability, and that different instruments must be brought into play in the two cases (Byerlee *et al*, 2005). The ideas expressed in this book may be considered as following on from this tradition. They are novel in that all three types of instability are considered, and all the instruments that could be used to tackle them are analyzed systematically.

We will now consider successively the situations of "natural", "imported" and "endogenous" instability. The means to tackle "mixed" forms of instability (cumulating several causes) will be analyzed later (1.3.3).

Stabilizing prices when the instability is natural in origin

Natural instability is caused by two phenomena: harvests concentrated over a few months of the year (generating price seasonality) and variable harvest volumes due to natural hazards such as drought and attacks by locusts. Here it may be underlined that a poor harvest in year t will affect not only price levels in t but also in $t+1$ as "poor years" generally lead to a depletion of stocks. The following campaign is therefore conducted without a safety net as stocks are too low to provide any buffer effect for another possible poor harvest. A succession of poor harvests may therefore have dramatic effects. Also, even if the harvest in $t+1$ is normal, prices will doubtless stay relatively high as the stocks depleted in t need to be replenished, putting upward pressure on prices.

Natural instability therefore causes three problems:

- price seasonality, *i.e.* a collapse in prices immediately post-harvest (which harms producers) followed by a progressive rise until prices reach very high levels during the period immediately before the next harvest (the "lean period");
- price variability from one year to another, depending on the current year's harvest volume (soaring prices in "poor years" and substantial price drops in "good years");
- price variability from one year to another, depending on the previous year's harvest volume, since harvest volume in t affects stock levels in $t+1$ (these stock levels may be insufficient if the harvest was poor in t or may conversely be excessive if a bumper harvest occurred in t).

Price stabilization aims to provide a solution to all three problems and may be achieved by different means that are not mutually exclusive: production modernization, market modernization and public interventions aiming to stabilize internal availabilities. We will now consider these different options one after another.

Modernizing production

This is the most intuitive approach given that, as natural price instability is caused by production characteristics (concentration in time, variability), it seems quite logical to try to solve the problem by acting on production.^[16]

Price seasonality can be reduced by spreading harvests over time. And this (depending on the crop), means developing off-season varieties, using glass-houses or resorting to irrigation (if this provides for several harvests a year).

The impact of production variability on prices can be lessened by reducing production hazards or decreasing production susceptibility to these hazards. The first option is virtually impossible in practice, except perhaps on an international level (talks on climate change). The only possible option on the national scale is therefore to reduce production susceptibility to hazards, which means using the appropriate equipment or inputs (irrigation, drought-resistant varieties, phytosanitary products, etc.).

Reducing the impact of production variability in t on prices in t+1 means rendering production more responsive to price movements. If producers react vigorously to a price rise by increasing their production plans for the following year, a poor harvest in t will probably be followed by a good harvest in t+1, and this will allow traders to replenish their stocks without putting upward pressure on prices.^[17] Rendering production more responsive to price movements means that producers are able to sow more land or increase yields. The first option depends on land availability and on land rights.^[18] It also depends on the possibility of product substitution in plot allocation. Increasing yields means intensifying production using high-productivity equipment or inputs.

[16] The modernization of production is a worthy goal in itself as it is a necessary step along the road of economic development (Timmer, 1988 and 2009a; World Bank, 2007). But it is envisaged here solely from the angle of its potential contribution to a reduction in price instability.

[17] If expected, production's response may even have an immediate effect on prices: as producers and traders expect the harvest to be good in t +1, and prices low, they will get rid of their stocks during year t and this will temper the price rise induced by the poor harvest in year t.

[18] According to certain experts, land availability is the key to tackling the problem of food price instability in Africa (De Janvry and Sadoulet, 2008).

1. Developing a strategy to manage food price instability

The key to the three problems appears to lie in using appropriate inputs or equipment. However, *each problem requires specific inputs*. For instance, the use of early, late and off-season varieties can reduce seasonality by spreading the harvesting period, whereas drought-resistant varieties can render production less sensitive to natural hazards, and high-yield varieties can render it more responsive to price.^[19] Moreover, *the timing is different for the different problems*. Reducing price seasonality and production variability requires the use of appropriate inputs *ex ante*, whereas the third problem can be solved by increasing inputs *ex post* if the harvest is poor, thereby stimulating production the next year (reducing the probability of two successive poor harvests).

The solution therefore lies in encouraging producers to invest in different inputs and equipment. This supposes *i*) that these inputs are available; *ii*) that producers have access to them; and *iii*) that the risk is not too high. Producers only have access to inputs if aware of their existence, know how to use them, and are aware of the advantages they can procure. Also, these inputs must not be too costly and must be available on credit. In general, the market in developing countries is insufficient for all these conditions to be met. Technologies may on occasion have undergone little development or may be overlooked by private research (see for example the case of millet varieties). The inputs market is often oligopolistic. Also, most producers in developing countries find it difficult to gain access to credit, and almost impossible to procure any form of risk hedging mechanisms (weather insurance, futures).^[20]

State support is therefore required to stimulate producer investments. This support can take three forms:

- production of public goods (research and extension services);
- setting up of temporary input subsidies (seeds, fertilizers, pesticides), accompanied if necessary by the possibility to defer payment;
- interventions to maintain prices within a predefined band.

The first is unlikely to cause controversy, though recourse to private research and private agricultural advisory services should also be envisaged when possible.

[19] These categories show a great deal of overlap: many inputs both increase yields and reduce sensitivity to natural hazards.

[20] It should also be specified that recourse to some risk hedging instruments may lead to an increase in production variability. For instance, crop insurance may encourage producers to replace drought-resistant varieties with high-yield varieties. The same effect may occur with other risk hedging instruments such as futures markets (Newbery, 1987).

The aim of subsidies is to promote producer access to inputs. For the same reason, subsidies may need to be accompanied by credit, with payment for the inputs being deferred. The effectiveness of these subsidies to a great extent depends on how they are allocated (governance issues may arise as subsidized inputs have sometimes been used in the past by politicians to maintain a network of cronies, see Bates, 1981). These subsidies are destined to disappear (after a possible tailing-off period) with the development of green revolutions, the growth of an inputs market and rising producer incomes.

Price stabilization aims to increase farmers' investments by two means. First, by reducing the price-risk they face (they are known to be risk-averse). Second, by facilitating their access to credit (banks are reluctant to lend them money if the price risk is too high). If it is to reach this goal, stabilization must aim to maintain the price within a predefined band, thereby protecting producers against price collapses (this is the role of the floor price) and against unpredictable price-reducing State interventions (this is the role of the ceiling price). This price stabilization is vital if we are to break the vicious circle consisting of "price instability – low agricultural investment – production susceptibility to natural hazards – price instability". Moreover, successful green revolutions of the past have coupled access to high-performance technology with price stability (Timmer, 1988).

Modernizing markets

Modernizing food product markets (nationally or regionally) is the second (complementary) means of reducing natural price instability and consists in facilitating the emergence of efficient institutions and infrastructure for the marketing and storage of food products (development of A-instruments). The aim here is to boost the intensity of spatial arbitrage (through trade) and temporal arbitrage (through private storage).

Price seasonality can thus be reduced by trade and private storage. If supplies for cities are drawn from many areas that are sufficiently far apart for harvests to take place at different times, then this trade provides urban consumers with low prices for a large part of the year. This mechanism is pushed to the extreme with international trade that pools the production of many countries located in different climatic areas. It therefore follows that international prices virtually never show any seasonality. *Storage* (by producers or traders) also plays a decisive role. By purchasing immediately after the harvest (when prices are low) and selling in the lean period (when prices are high), traders tend to reduce price seasonality. And because of the competition between them, the price difference between the post-harvest period and the lean period should match storage costs. However, if traders lack access to credit, private

storage may not be competitive (with stocks being concentrated in the hands of a small number of big traders).

The impact of harvest variability on prices can also be considerably buffered by trade and storage. Trade between regions that are sufficiently far apart for natural hazards not to be correlated will diversify risks. Given that there is no valid reason for regions that are far apart to experience a drought or locust attack at the same time, some regions will be in deficit while others are in surplus. Trade can therefore compensate the deficit of some by the surplus of others. Storage may also to a certain extent soften the impact of harvest variability on prices for if sufficient in scale it can draw on the surpluses of previous years to compensate for current deficits. However, the quantities stored are unlikely to be sufficient to buffer significantly the effects of a poor harvest (and even more so a succession of poor harvests) since producers and traders very seldom practice multiannual storage (precisely because it is extremely risky due to harvest variability). ^[21]

Note should be made that market instruments can reduce natural instability only if they sufficiently promote trade (by connecting distant regions) and private storage (by encouraging producers and traders to build up stocks for the following year).

This means that market instruments (A-instruments) must be greatly developed. To stimulate long-distance trade, transport costs must be reduced, but also, more broadly, traders must be informed of large-scale opportunities for arbitrage. Transaction costs must also be reduced *i.e.* the costs entailed by searches for trading partners, negotiations with these partners and commitment enforcement (delivery of the right quantity and quality at the right time; payment). This can involve the setting up of infrastructure (namely for transport and communication) and many market institutions such as weights and measures systems, grading systems, Market Information Systems (MIS), dispute settlement systems or commodity exchanges (2.1.3). Specific actions may also be undertaken to strengthen the connection with international markets (other than reducing import and export tariffs or quotas). Roads may be improved to reduce shipment costs between ports and the country's interior. And specific action can be taken to render locally-produced grain "tradable" on the international market by standardizing quality (in order to constitute homogeneous lots) and centralizing stocks

[21] Economic models showing that competitive private storage is an optimal solution to the problem of crop variability are based on the (totally unrealistic in developing countries) assumption that the producers and traders who build up stocks are risk-neutral, *i.e.* either their behavior is unaffected by the price risk they are facing, or they have full and cost-free cover against this risk (Williams and Wright, 1991).

(so that sufficient volumes may rapidly be mobilized to fill containers.^[22] Efforts may also be made to render non-tradable goods more substitutable with tradable goods.^[23] Similarly, efforts to encourage storage may require the setting up of market institutions. For instance, difficulties encountered in obtaining credit (one of the main obstacles to storage) can be reduced by using the stocks themselves as collateral. This can be achieved using warehouse receipt systems. These different instruments (and their contribution to the stimulation of trade and storage) are described in detail in chapter 2 (see in particular 2.1.3.).

But *the development of market instruments (A-instruments) may be obstructed by a whole array of factors.*^[24] Firstly, certain A-instruments need to be backed up by public goods that are often lacking (for instance, in order to function properly, warehouse receipt systems need a regulatory framework and a body of accredited certifiers, see 2.1.). Secondly, the development of market instruments is often hindered by "circularities" (a market actor's drive to use an instrument often depends on the extent to which this instrument is used by other actors; the development of many A-instruments requires others A-instruments to be already in place^[25]). Thirdly, price instability may discourage the development or use of market instruments: their development requires risky investments by market actors whereas their use often entails exposure to price-risk. Moreover, many households react to price instability by developing self-consumption strategies in order to disconnect themselves from the market. Finally, price instability tends to favor the largest actors (able to pool the price-risk as they conduct many transactions), thus reducing competition on the market (Newbery and Stiglitz, 1981).^[26] These mechanisms generate vicious circles as a lack of development in A-instrument, market narrowness^[27] and a lack of competition contribute to maintaining high levels of price instability.

In short, *markets must be modernized, but this is a long and uncertain process that requires State support.* The State must: *i)* provide the public goods necessary for A-instruments to function (legal framework, transport and communications infra-

[22] As we shall see later, warehouse receipt systems can play a major role in both these actions (2.1.3).

[23] For example, in West Africa, were (non tradable) millet to be processed in such a manner that rendered it simple and rapid to prepare, this would enhance its substitutability with (tradable) rice.

[24] For a more developed analysis of the main obstacles to the emergence of A-instruments (and how to overcome these obstacles), see 2.1.5.

[25] For an illustration, see the case of warehouse receipt systems in box 3.

[26] In fact, the wholesale sector in West Africa is far more concentrated in Sahel countries (where natural instability is far more marked) than in coastal countries (Galtier *et al.*, 2012).

[27] For instance, in Sahelian countries, only 20% of the millet and sorghum produced is marketed.

structure, control of weights and measures, accreditation of certifiers, etc.); *ii*) temporarily subsidize certain instruments such that they reach the critical size required to develop by themselves and enable other A-instruments to develop more easily (overcoming circularity problems); and *iii*) maintain prices within a given band through public interventions in order to reduce the risks run by private actors and thus prompt their investment in A-instruments, and encourage them to rely on the market. In order not to prevent markets from functioning, the price should be free to fluctuate within the predefined price band whose bounds must be set realistically and must be known in advance. We will return to this subject in more detail later (see 1.5.3.).

Intervening to hold prices within a predefined band

We have already seen that price-stabilizing public interventions are necessary both to compensate for the current limitations of production and markets, and to facilitate their modernization by stimulating producer and trader investment. *Does this mean that public intervention is necessary only temporarily “in the meantime” until the country develops efficient infrastructures and institutions for production and markets?* At first glance, it seems that we can answer in the affirmative given that if a country can rely on efficient farms and markets, prices are more stable because production responds to price movements and spatial and temporal arbitrage is intensified. Moreover, price instability is less of a problem when production has already been modernized. However, the question is somewhat more complex for *even when highly efficient production and trade systems are in place, price instability can still be excessive for consumers*. First, private stocks are far too low to prevent prices from soaring after a poor harvest. One reason for this, as already mentioned above, is that harvest variability from one year to the next makes multiannual storage a very risky business. Second, even supposing that storers are entirely covered for price-risk (or are risk-neutral, which comes to the same thing), private stocks would still be insufficient to prevent the price soaring after a poor harvest (Williams and Wright, 1991). Therefore, even with modern farms and markets, public interventions (based on C-instruments) are still necessary to protect consumers. The floor price can be gradually lowered, then discarded as green revolutions develop,^[28] but the ceiling price must be maintained since staple food products account for a significant part of household expenditures.

[28] The floor price must be reduced gradually, and not too rapidly, or too many households will abandon agriculture all at the same time, and redeploying this labor newly released by green revolutions will be a problem.

What can be done to stabilize prices? Natural hazards affecting production can drive the price up to the import parity price (P_M) or down to the export parity price (P_X). Here, external trade plays a regulatory role by managing surpluses (that are channeled onto the international market when prices fall to P_X) and deficits (that are supplemented by imports when the price reaches P_M). Price movements are therefore bounded by the parity price band (see figure 5). However, this band can be too low or too high (due to unstable international prices) and too wide (especially for landlocked countries because of transport costs from ports). Foreign trade is therefore not enough to prevent prices from reaching very high levels (affecting food security) or very low levels (discouraging production, storage and more generally investment in production and market modernization). The situation is even worse for "non-tradable" products, i.e. those not liable to be involved in international trade.^[29] As they are often in part substitutable with tradable products, movements in their price are restricted by the parity price of these latter products, but the price band in this case is often very wide.^[30] Public interventions are therefore required to prevent the price from rising or falling to excessively high or low levels.

Which instruments should be used? We have two options.

The first is to regulate the parity price band, which means using the international market to dispose of surpluses or supplement deficits, and thus stabilize the amount available on the domestic market. This option is based on *variable* measures (tariffs, subsidies or quotas) that aim to regulate imports and exports.

The second option is to set up public stocks that are able to purchase surpluses (thus withdrawing them from the market and preventing the price from collapsing) and make up for deficits (by destocking). The aim is to hold the price within a narrower band than that bounded by the parity prices.

[29] Millet, sorghum, cassava and yam are good examples of non-tradable goods.

[30] This can be illustrated by the case of the millet consumer price rise during the 2005 "locusts' crisis" in Mali. In this country, millet consumer price is capped by the price of imported rice. Thus, following a poor harvest, when the millet consumer price spiked, its rise was only stopped when consumers massively substituted imported rice for millet (the price of millet stabilized at 250 FCFA/kg, i.e. 25 FCFA/kg below the price of imported rice, see Galtier *et al.*, 2010). The parity price of rice proved to be an effective ceiling price for millet price (thanks to its substitution by imported rice, millet ceased to rise in price as of June 2005, four months before the next harvest). However, this ceiling was very high: the price of millet nevertheless rose by 150% (from 100 FCFA in October 2004 to 250 FCFA/kg in June 2005)!

1. Developing a strategy to manage food price instability

Two arguments support recourse (when possible) to regulation through the international market rather than through buffer stocks. First, it is likely to be more effective given that for small countries,^[31] the international market is akin to a limitless stock.^[32] These countries can always turn to the international market to make up for their deficits or absorb their surpluses.^[33] By contrast, public stocks are limited in size, and situations will inevitably arise where stocks are exhausted and can no longer temper price rises (Townsend, 1977). Stocks would need to be colossal to cope with a succession of poor harvests, or absorb a succession of bumper harvests, and would therefore be very costly. The second argument is that recourse to the international market is likely to be less costly: *tax exemptions or subsidies on imports or exports only have a cost when implemented*, whereas public stocks have a cost even when not used (logistics cost and financial cost).^[34]

But, in certain situations, stabilization by recourse to the international market is impossible, ineffective or costly. Impossible if border controls contravene World Trade Organization (WTO) rules or the country's other international commitments (e.g. if the country is part of a customs union or a free trade area). Impossible again if the country's borders are "porous", i.e. difficult to control by the State. Ineffective if there is little or no competition in the import (export) sector of the product concerned, as this enables importers (exporters) not to pass on tax reductions. Ineffective again if the country has a limited import capacity (e.g. low foreign exchange reserves). Or again, if the country that seeks to stabilize prices is considered as "large" by the

[31] For the theory of international trade, a country is deemed "small" for a given product if its imports or exports of this product account for a sufficiently small proportion of international trade for them not to have an effect on the international price.

[32] To what extent can the regional market play the same "limitless stock" role as the international market for a given country? This question is of the utmost importance given that many grains that are non-tradable on the international markets are traded in large quantities on the regional market (e.g. millet and sorghum in West Africa). If regional trade is to play the same role as the international market, at least two conditions must be fulfilled: *i*) natural hazards in the country and in the other countries in the same regional area must not be correlated, and *ii*) the regional market must be able to absorb all the country's surplus and make up for all its deficit (which means that this country should be "small" in relation to the regional market). Even when these conditions appear to be met, the effect is not guaranteed, as illustrated by the 2005 Niger crisis where very few grain imports were obtained from Nigeria (Michiels and Egg, 2008).

[33] The limitless nature of the "stock" represented by the international market may be called into question by speculation or panics that lead a large number of exporting countries banning exports. This question definitely needs to be raised given the wave of speculation and panic that swept the international rice market in 2008. It should also be noted that the same problem arises with the regional market (see grain export bans decided by many West African countries in 2008 despite customs unions and free-trade areas).

[34] A study on wheat and rice in India showed that, for the same sum spent by the authorities, it is possible to obtain a 4-fold greater decrease in the price coefficient of variation by using variable border measures rather than buffer stock, even when complying with WTO restrictions (Srinivasan and Jha, 2001).

theory of international trade, for in this case the international market no longer constitutes a limitless stock from which the country can draw what it lacks, or into which it can pour its surpluses. Ineffective, finally, when international prices or exchange rates are themselves unstable (this corresponds to a "mixed" situation where the instability is both natural and imported). Finally, recourse to the international market can prove costly for a landlocked country for, in this case, the parity price band may be very wide. In such cases, efforts to stabilize domestic prices may require substantial tax cuts or generous subsidies. More details on this debate can be found in chapter 2 (2.3.3.).

Conclusion regarding the treatment of natural instability

In conclusion, what strategies and instruments should be used to combat natural instability?

It is essential, though insufficient, to modernize production and markets. This modernization needs State support in the form of public goods or subsidies. Public goods mainly take the form, firstly, of agricultural research and extension services (aiming to develop and disseminate technological packages) and, secondly, the setting up of an enabling environment for markets (e.g. legal framework, control of balances, certifier accreditation). Subsidies concern both inputs (agricultural stimulus packages) and certain market institutions. In this latter case the aim is to resolve the circularity problems created by the fact that an actor's drive to use an instrument may depend on *i*) the use made of this instrument by other actors, and *ii*) the existence of other instruments. These subsidies must be designed to be temporary, *i.e.* they must be gradually reduced then phased out as production and markets are progressively modernized.

Also, given that production and market modernization is dependent upon investment by producers and traders, and that these are risk-averse, this modernization will not come about if the price risk is too high. Public intervention is therefore required to hold prices within a predefined band. This will facilitate production and market modernization by stimulating the necessary investment, on condition that these interventions are triggered only when the price reaches the predefined thresholds which must be known to all and set at levels that allow the market to function (the floor price must not be set too high nor the ceiling price too low). These interventions may be based on the regulation of imports and exports, or on recourse to public stocks. This public price-stabilization scheme must be maintained (in a lighter form) even after production and markets have effectively been modernized, and this to protect consumers from price surges (which means keeping the ceiling price). Let us now consider the case of instability stemming from international markets, or "imported" instability.

Stabilizing prices when the instability stems from international markets

“Imported” instability stems from instability in international prices, exchange rates or freight costs. For importing countries, it translates as unstable import parity prices: the cost price of imports may vary markedly from one month to the next. This potentially affects the balance of payments, the price of imported food and the price of locally produced food. Soaring international grain prices inflate the bill paid by grain importing countries and generate an increase in the price of imported grain which can in turn be passed on to the price of local grain (through consumer substitutions). Mirroring this, if international prices collapse, this can depress domestic prices, which is harmful for producers. The same mechanism comes into play for exporting countries through the export parity price, *i.e.* the price received by exporters. Here, a surge in international prices (as occurred in 2008) translates as an increase in exports, and this puts upward pressure on domestic prices.

Parity price instability can be passed on in only a mitigated or delayed manner under the effect of private storage given that importers can use their stocks (built up before the price surge) to delay and spread the price rise over time. They may also be driven to cut their margins (Daviron *et al.*, 2008; Dawe, 2008; David-Benz *et al.*, 2010; Gilbert 2010b). But private storage has only limited effects on the market when international prices are subject to marked instability, which is why public interventions should be envisaged.

How can countries (or Regional Economic Communities) protect themselves from turbulence on international markets? As “imported” instability affects domestic prices through the import or export parity price, two options are possible to protect domestic prices from imported instability. The first consists in stabilizing parity prices by variable taxes or subsidies on imports or exports. The second aims to disconnect domestic prices from parity prices, which can be achieved by *i*) putting quotas on imports or exports, or *ii*) recourse to public stocks. We will now consider these two options.

Stabilizing parity prices

Parity prices of a given product in a given country are dependent upon international price (P_{int}), freight cost (Cf), exchange rate (ER), transport cost from the border to the country’s interior (Ct), and also the tariffs placed on imports (t_M) or exports (t_X). Import parity price (P_M) and export parity price (P_X) are therefore given by the following expressions:

$$P_M = [(P_{int} + Cf) \cdot ER] (1 + t_M) + Ct$$

$$P_X = [(P_{int} - Cf) \cdot ER] (1 - t_X) - Ct$$

Parity prices can therefore be adjusted upward or downward by varying the tariffs placed on imports (t_M) or exports (t_X). These tariffs can be adjusted in an *ad hoc* manner. They can also be adjusted automatically by indexing to Free-On-Board (FOB) and Cost Insurance Freight (CIF) prices converted into local currency. By varying tariffs, it is therefore possible to fully stabilize parity prices^[35] or, more modestly, to prevent them from rising or falling to excessively high or low levels. It may prove necessary to convert taxes into subsidies. For example, if the international price soars, as in 2008, removing all import tariffs ($t_M = 0$) may not be enough to prevent the import parity price from rising. A negative tariff must in this case be implemented ($t_M < 0$) *i.e.* subsidies on imports. Here it should be specified that indexed variable tariffs are perfectly predictable by market actors since they adjust automatically.

However, this parity price stabilization strategy may prove difficult to implement in practice. Firstly, WTO greatly restricts the use of variable tariffs, but countries nevertheless have some room for maneuver (see 2.3.). Secondly, cuts in tariffs (or subsidies) generate losses for the State, and this may compromise long-term use of these measures. However, these losses may in principle be compensated by the revenues generated in periods where tariffs are high. Variable tariffs therefore generate more an instability than a decrease in fiscal revenues. Another obstacle to variable tariffs is their political feasibility. For example, the producers' lobby may be opposed to any reduction in import tariffs (and even more so to subsidies). The solution to this problem lies in symmetry: the variable tariffs system must be designed to protect both consumers (if international prices soar) and producers (if international prices fall). This requires recourse to taxes indexed on prices since *ad hoc* changes in tax rates do not guarantee reciprocity (producers will more readily accept reductions in import duties if they have the guarantee that these duties will be increased if international prices fall). Another difficulty lies in the passing on of tariff reductions when there is little or no competition in the food products import or export sector. In this case, the State may act itself as an importer or exporter (injecting competition into this sector). An alternative solution is to regulate importer or exporter behavior by signing contracts with them where, in order to benefit from the tax reduction, importers (exporters) must commit to a certain selling (buying) price. Compliance can be checked through State-monitored stores.^[36] Finally, and obviously, the country

[35] The CIF price corresponds to the cost price of imports at the port where delivered. It is therefore $P_{int} + Cf$ and the CIF price converted into local currency is $(P_{int} + Cf) ER$. If t_M varies in such a manner to compensate for variations in the CIF price converted into local currency, $(P_{int} + Cf) ER (1 + t_M)$ is entirely stable, as therefore is P_M .

[36] However, it is difficult to enforce this type of contract in periods of marked international price instability, as shown by the example of Mali in 2008 (Galtier *et al.*, 2010).

must be able to control its borders. Unfortunately, many countries have porous borders with their neighbors and, through re-export trade this can lead to the country becoming porous to the international market.^[37]

Let us now consider the complementary strategy that consists in reducing the passing on of parity price instability to domestic prices.

Reducing the passing on of parity price instability to domestic prices

Two options are possible in efforts to reduce the passing on of parity price instability to domestic prices: *i)* place quotas on imports or exports, and *ii)* disconnect the domestic market from the international market through the use of public stocks. As we shall see, these two options are very different in terms of cost and effectiveness depending on whether the country is an importer or an exporter, on whether we consider price rises or falls, and on whether the country is close to or far from self-sufficiency (greatly in surplus or deficit).

Let us consider the case of an *importing country*. If the international price falls, this country cannot rely on public stocks, for, in order to prevent the domestic price from falling beneath the import parity price, public stock would need to buy all the supplies available on the international market! In such a situation, the country can theoretically protect itself by placing quotas on imports (but WTO forbids such measures). By contrast, when the international price rises, quotas are powerless but public stocks can to a certain extent be effective, on condition however that they are sufficiently large to allow the country to forgo imports. This assumes that the country is not far from food self-sufficiency. Otherwise, stocks may run out if international prices remain high for some time (as illustrated by the Indonesian crisis of 1997-1998, see Gérard, 2000).

Let us now consider the case of an *exporting country*. If the international price falls, export quotas are of no assistance. By contrast, if public stocks purchase part of domestic production, this will support the producer price. But this is not problem-free as the State finds itself burdened by a huge stock that it has difficulty off-loading onto the international market (as illustrated by Thailand's experience with rice). If the international price rises, export quotas are the most suitable instrument. WTO authorizes such quotas for food products (even export bans are allowed).^[38]

[37] A famous example of this is Benin that for many years re-exported rice to Nigeria during the period that it banned or heavily taxed rice imports (Galtier and Tassou, 1998).

[38] The prohibitions placed on quantitative measures – quotas, licenses, bans – does not apply to the export of food products (see article 11 of GATT 1994 and article 12 of the Agricultural agreement). For more details on how WTO rules restrict the use of C-instruments, see box 13.

Quotas and public stocks are therefore incomplete instruments (depending on whether the country is an importer or exporter, they tackle only rises or falls in international prices). But they are also complementary: public stocks can be used to tackle situations that quotas are unable to manage, and *vice versa*. More precisely, quotas can hold domestic prices at a point outside the parity price band ($P_{\text{dom}} > P_M$ or $P_{\text{dom}} < P_X$). Conversely, public stocks can be used to hold domestic prices within a narrower band than that bounded by parity prices ($P_X < P_{\text{dom}} < P_M$).

Does this mean that a combination of public stocks and quotas is a satisfactory answer to imported instability? No. And this for two reasons. Firstly, import quotas are prohibited by WTO. And secondly, the public stocks required would necessarily be huge as they must be able to absorb all a country's surpluses or compensate for all its deficits. This is the price to be paid for being able to temporarily disconnect from the international market.

Conclusion regarding the treatment of imported instability

The ultimate weapon against imported instability would be to apply variable tariffs or subsidies on imports or exports (indexed on FOB and CIF prices in local currency). But this instrument is currently prohibited by WTO. Only *ad hoc* decreases and increases in tariffs are tolerated. But this means that all the benefits of indexed tariffs are lost (guaranteeing reciprocity between producer interests and consumer interests, rendering changes in tax predictable). Also, *ad hoc* increases in import tariffs are possible only within certain limits (the price must remain below the "consolidated level" or must comply with the conditions of the Special Safeguard Clause).^[39] *Other instruments can also be used (import and export quotas and public stocks), but they are asymmetrical:* depending on whether the country is an importer or exporter, these instruments can either mitigate only increases or only decreases in international prices. Also, possible recourse to quotas and public stocks is often restricted either by WTO rules (the case for import quotas) or by the cost of these instruments (the case for public stocks).

It should also be noted that regardless of which instruments are used, all policies designed to provide protection against imported instability are liable to be rendered ineffective by spillover effects. This occurs if the borders with neighboring countries are porous. If country A manages to protect itself from soaring international prices, then the price on its domestic market will be far lower than that in neighboring

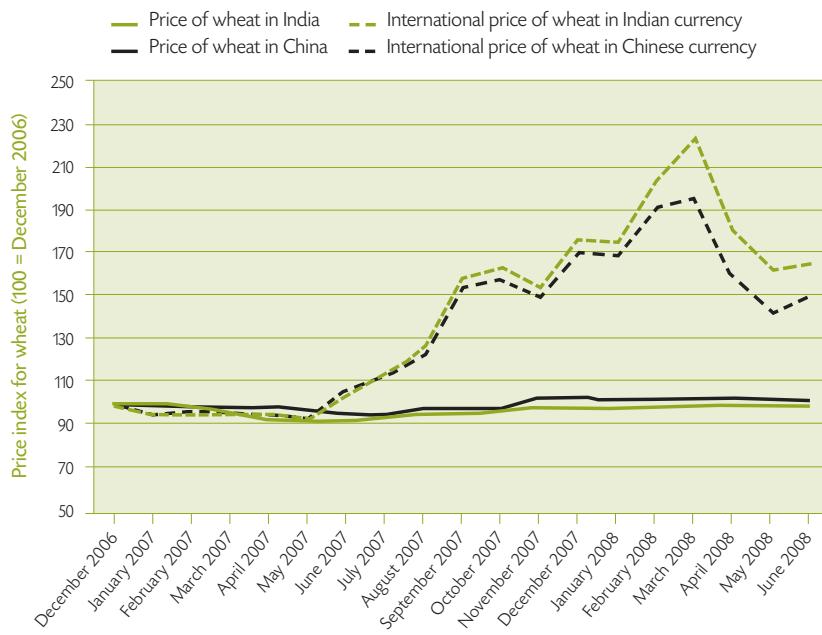
[39] See 2.3.5. for more details on WTO rules concerning price stabilization instruments.

1. Developing a strategy to manage food price instability

countries. This is likely to induce (legal or illegal) exports to these countries, thus raising the price in country A and compromising the policy implemented by this country to mitigate imported instability. A symmetrical situation may arise if the country manages to maintain a relatively high producer price despite falling international prices. Here, the product is liable to flood into the country from neighbors (capitalizing on the high price), driving prices down. The answer here lies in better border control (when possible) or in choosing to tackle imported instability by implementing measures on a regional scale.^[40]

Despite all these difficulties, it is possible for a country that deploys adequate resources to control imported instability. Shining examples of this are China and India during the 2008 price crisis (see figure 8).

Figure 8 Wheat prices on the international market, in China and in India



Source: OECD, 2009.

[40] This problem arises with all stabilization policies but it is particularly acute for imported instability for here the price instability correlates in all countries.

We should also note that a country close to self-sufficiency will obviously find it far easier and less costly to protect itself from soaring international prices than will major exporting or importing countries. The success of the 2008 Chinese and Indian stabilization policies was partly due to a long-term policy aiming to ensure self-sufficiency in wheat. After a long period of suffering deficits, these two countries have now reached self-sufficiency, without being in surplus (see figure 9).

Figure 9 *China and India have reduced their connection with the international wheat market*



Source: United States Department of Agriculture (USDA) PSD.

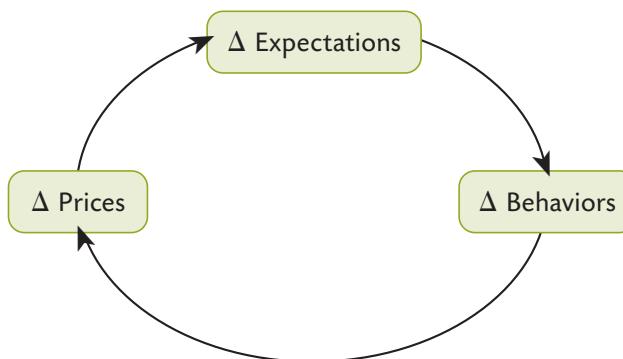
Last but not least, it should be noted that all the measures taken by countries to protect themselves from imported instability may increase price instability on international markets, and thus affect other countries. Policies designed to achieve self-sufficiency make international markets narrower and therefore more unstable (because more susceptible to natural instability). Variable import tariffs render the demand of importing countries less sensitive to variations in international prices, enhancing instability on international markets. Finally, if exports are restricted in response to soaring international prices, this reduces supplies on the international market, further increasing prices (as occurred in 2008 for the rice market, see Headey 2011). These effects are nevertheless negligible for "small" countries, i.e. those whose imports and

exports of the product considered account for only a small proportion of international trade. We will return to this point when addressing the role of the international community (see 1.6.), but let us now consider situations where price instability is of endogenous origin.

Stabilizing prices when instability is endogenous in origin

Although there are different types of endogenous instability, all are caused by a vicious circle between "expectation instability" and price instability (see 1.2.3.). It is of course perfectly normal (and desirable) for economic actors to adjust their expectations when receiving new information. But, if they base their price expectations on past prices, this can generate a *self-sustained* instability of expectations. In this situation, expectation instability causes instability in production and storage behaviors, which in turn generates price instability that further feeds expectation instability (see figure 10).

Figure 10 Mechanism responsible for endogenous instability



Source: author.

This mechanism applies to all the different types of endogenous instability, namely the cobweb, speculative bubbles and panics. *The cobweb* mainly concerns production behaviors (plot allocation to different crops, amount of inputs employed). These behaviors depend on expectations for $t + 1$ prices and these expectations in turn depend on past prices. High prices induce overly optimistic expectations, excessive production and low prices. This then leads to pessimistic expectations and insufficient production in $t + 1$ which in turn causes high prices, overly optimistic expectations and further excessive production. *Speculative bubbles and panics* mainly concern

behaviors related to storage (stock retention by traders, massive purchasing by consumers to build up stocks) and futures trade (when such a market exists). If some economic actors expect prices to be high, they will increase their buying and their stocks, and reduce their selling. This diminishes supply, drives up prices and leads other actors in turn to anticipate a rise. This then snowballs. Let us take note that the cobweb generates cycles (alternating low and high prices) whereas speculative bubbles and panics cause either a cumulative rise or a cumulative fall (a price rise in t will tend to cause a fresh rise in $t + 1$).

Fighting endogenous instability therefore means breaking the vicious circle illustrated in figure 10, and this can be achieved by tackling each of the causal relationships. Endogenous instability can therefore be dealt with by three (complementary) approaches. The first consists in reducing the effect of price instability on expectations, and is based mainly on the provision of information. The second consists in reducing the effects of expectation instability on production or storage behavior (meaning this behavior must be rendered less sensitive to price movements). The third consists in organizing public interventions to prevent herd behavior from impacting prices. This means intervening to pierce speculative bubbles, dampen panics or control the cobweb effect, by preventing prices from reaching extreme values. Let us now consider these three approaches individually.

Providing information to improve the quality of expectations

Here, the information made available to economic actors must be broadened such that they no longer base their expectations solely on past prices (the engine of endogenous instability).

This information must first and foremost concern *future changes in the causes of price instability*. The quality of price expectations could thus be improved by disseminating information on harvest forecasts and on trends and perspectives in international prices, exchange rates and freight costs. Data on the latter three could also be aggregated by directly providing information on expected changes in parity prices, as is already provided by certain market information systems (MIS).^[41]

Information must also be provided *about public interventions* for these can also feed expectation instability: if a rumor is circulating that the State is preparing to intervene

[41] Weekly bulletins from the South African Grain Information Service (SAGIS) providing this kind of information on parity prices are available online (<http://www.sagis.org.za>).

on the market, this affects production and storage behavior, and ultimately causes prices to soar or collapse. The solution to this problem lies in making public interventions predictable by announcing intervention prices in advance and complying with these prices. If these conditions are fulfilled, public interventions have a doubly stabilizing effect on the expectations of private actors by guaranteeing that the State will not intervene while prices remain within the predefined band, and by rendering it improbable that prices will move outside this band. Here it may be added that, in order to ensure this, public interventions must be credible, *i.e.* private actors must believe that the State will comply with the announced intervention prices (see 1.5.3.).

Finally, information *on stocks* also plays a decisive role: since actors expect stocks to absorb shocks, large stocks have a stabilizing effect on expectations (regardless of the cause of the expectation instability). The more visible the stocks, the greater the effect, for stock visibility *i*) provides information about the size of stocks, *ii*) guarantees the credibility of this information, and *iii*) renders this information common knowledge (everybody knows it and knows that the others know it). This last point is extremely important as it generates a stabilizing effect through cross-expectations: each actor expects prices to remain stable not only because of the expected buffering effect of stocks but also because he knows that other actors will also expect price stability and therefore will not panic or overspeculate. The increase in stock volumes and in stock visibility can be stimulated by the development of warehouse receipt systems or the constitution of public stocks.

Therefore, both A-instruments (MIS providing price or harvest forecasts, warehouse receipt systems that increase stock volumes and visibility) and C-instruments (interventions aiming to hold the price within a predefined band, public stocks) can contribute to improving the quality of market actor expectations.

Finally, it should also be specified that all measures that aim to improve the quality of expectations must be set up in a "preventive" manner rather than be improvised *ex post* to slow herd behavior (speculative bubble or panics). Information disseminated by governments during the storm (in the hope of an "announcement effect") often fails to have any impact.

Reducing the effects of expectation instability on behavior

This approach is complementary to that immediately above and consists in reducing behavioral sensitivity to the erratic instability of price expectations. Concerned are production and storage behaviors, and the buying and selling of futures when a country has such a market.

In practice, it is very difficult to influence storage behavior (unless extreme measures are taken such as the requisitioning of stock).

By contrast, it is possible to render economic agents on the futures market less sensitive to the erratic variability of their expectations. This can be achieved through quantitative restrictions (placing a ceiling on the number of contracts an agent can hold) or through taxes (very low taxes on futures transactions). The first of these measures (position limits) would appear to be more or less unanimously approved on condition that these limits apply only to non-commercial operators (i.e. those not involved in the physical market). The question then arises as to the level at which these limits should be set, given that too restrictive a level could reduce futures market liquidity. The second measure (a tax on futures transactions) draws its inspiration from the proposal made by J. Tobin to avoid the formation of speculative bubbles on foreign exchange markets, but, for now, would not appear to enjoy much support from decision-makers (although this is beginning to change).

Finally, let us consider the case of production price elasticity, i.e. its responsiveness to price movements. Given that it is precisely because production reacts excessively to price movements that cobweb dynamics are able to develop, reducing the price elasticity of production would at first sight appear to be an effective solution to this problem. This could be achieved by halting all support for the modernization of production, or even by levying taxes or placing quotas on production.

However, despite the fact that this kind of solution has been recommended by some of the main specialists in the cobweb,^[42] reducing the price elasticity of production is in general a very poor idea.

Firstly, measures designed to contain production price elasticity are contrary to the logic of production modernization (which very precisely aims to increase this elasticity). This is a problem because the modernization of production is a necessary step in economic development (Timmer, 1988; World Bank, 2007; De Janvry, 2009) and long-term food security. This modernization is the only means to decrease the average price of food products, and, in so doing, ease access by the many to food.

Secondly, production that is elastic to price movements has a stabilizing effect on natural instability (see 1.3.2.). Any measures intended to reduce production price elasticity therefore run the risk of increasing the instability of prices.

[42] Jean-Marc Boussard for instance recommends using production quotas to solve the cobweb problem.

Thirdly, marked production price elasticity has a rather beneficial effect in countering speculative bubbles and panics for if production “responds” to price incentives, supply increases and speculative (or panic) dynamics come to a halt. It is true that this effect is considerably restricted by production lags, but in some cases, due to actor expectations, prices will tend to decrease before the new harvest arrives on the market.

Finally, in some cases, investments in agricultural equipment can render production insensitive to price falls, and this has a stabilizing effect on the cobweb. This is in particular the case if the equipment is specific to the product concerned. It should be noted however that this may increase natural instability as, in this case, very pronounced price falls may be necessary to restore the market equilibrium.

Measures can nevertheless in certain cases be envisaged to *lower downward price elasticity of production*, i.e. the magnitude of the fall in production that results from a price slump. This elasticity may sometimes be excessive, particularly because drops in price cause producer income to fall and this may compromise their production capacity.^[43] This phenomenon tends to amplify price instability, be it natural (the reduction in production plans will exceed the reduction level required to restore market equilibrium) or be it due to the cobweb (when prices fall, production falls excessively due both to excessively pessimistic price expectations and the cash flow problems of certain producers). Specific actions are needed in this case to conserve the production capacity of vulnerable households. This can be achieved by facilitating producer access to risk hedging mechanisms and to credit, but access to these B-instruments is notoriously difficult for the most vulnerable. Another option would be to use D-instruments (safety nets), and this will be considered later (see 1.4.1).

Reducing the effects of behavioral instability on prices

This approach is based on public interventions that aim to bring speculative, panic and cobweb dynamics to a halt. These interventions may in principle involve regulating production, regulating imports and exports, or using public stocks. For instance, in a situation of runaway prices, it may be possible to *i*) initiate an agricultural stimulus package to boost production (by subsidizing inputs), *ii*) sell part of public stocks, *iii*) remove tariffs from or subsidize imports, and *iv*) limit exports (tariffs, bans or quotas).

Agricultural stimulus packages are often used by governments to counter soaring prices. But, it should be recognized that their effect on prices is not immediate and is relatively uncertain. Also, these stimulus packages are liable to enhance the cobweb

[43] This phenomenon was already known to the Physiocrats and even (before them) to Boisguilbert (Clément, 1999).

effect. We are therefore left with instruments based on public stocks or the regulation of imports and exports. We will not return here to the advantages and disadvantages of these two instruments (cf. 2.3.3 for a detailed discussion on this point). Depending on the situation, it may be preferable to turn to one, the other, or both. Suffice to say here that timing is crucial if speculative bubbles and panics are to be prevented. The instrument employed must have a very rapid effect on prices, and this tips the balance in favor of public stocks. Or must at least make it desirable to combine public stocks and the regulation of import and export flows, with public stocks here being used to manage the problem posed by import timelines.

Another parameter to be taken into account when choosing instruments is the possibility of speculative attacks: private operators betting on the failure of stabilizing interventions. These attacks above all concern interventions based on public stocks for as stocks are of a limited size, speculators may bet on stocks running out and therefore maintain their expectations of a price rise. Given the limitless nature of the "stock" represented by the international market, this risk is less pronounced for instruments based on the regulation of imports or exports. But risk there still is as private operators may speculate that the removal of import tariffs will be dropped as the measure cannot be sustained by the State budget. Overall, if the risk of attack is considered, then the preference must be for border measures (e.g. the removal of import tariffs or the setting up of import subsidies)^[44] or the constitution of large stocks.^[45]

Finally, it should be recalled that public interventions, regardless of the type of instrument on which they are based, must be predictable and transparent, *i.e.* must be founded on intervention prices that are announced in advance. This has the disadvantage of allowing speculative bubbles to inflate within the defined intervention price band, and this may also increase the risk of speculative attacks (for private operators know at what point the State will intervene). But this also enables public interventions to play a stabilizing role both *ex ante* (by stabilizing expectations and dissuading speculation, the cobweb and panics) and *ex post* (by containing speculative spirals and panics).

[44] Except in the specific case where speculation arises from the grain importing sector. In this case, a lifting of import tariffs will likely have little effect.

[45] Keeping stock volumes secret can reduce the risk of speculative attacks (Salant, 1983). But this also reduces the transparency of public intervention and thus runs the risk of increasing the crowding out effect of public storage on private storage. This is why, although almost all agree that transparency is required on intervention prices, the question is more controversial for stock volumes.

Conclusion regarding the treatment of endogenous instability

In short, the problem of endogenous instability can be tackled by providing prospective information (production forecasts, scenarios on the future course of the international market and parity prices), by increasing stock volumes and visibility (e.g. by developing warehouse receipt systems) and by rendering public interventions more predictable.

The problem of vulnerable households reducing their production excessively when faced with falling prices can be tackled by facilitating their access to B-instruments (price risk hedging tools and credit) and, above all, by using D-instruments (safety nets).

Finally, a public intervention scheme should be used to hold prices within a predefined band. Such a scheme, based either on public stocks or the regulation of imports and exports, will reduce endogenous instability in two ways: *ex ante* by stabilizing expectations (thus rendering speculative, panic and cobweb dynamics less probable) and *ex post* by bounding runaway prices within the floor price and the ceiling price.

We have examined above the various instruments that can be used in response to the main cause of price instability (natural, imported or endogenous). If, in a given country, price instability of a given product has a single cause, or at least one dominant, easily identifiable cause, the pages above should give us some fairly precise indications on the combination of instruments that may be brought into play. But, as we shall see shortly, the problem is in fact often more complex.

1.3.3. Combining instruments to tackle multiple-cause instability: designing price stabilization schemes

Practical difficulties of tackling multiple-cause instability

The price instability of a given product in a given country may have several causes. A particular rise in the price of millet in Mali can be explained by a drought or a locust attack, another by a rise in international prices (as in 2008) whereas a third may stem from persistent low prices in previous years (driving down farmer production through pessimistic price expectations and the reduced production capacity of some farmers).

Also, several factors may exert effects simultaneously and cause prices to soar or collapse. Sometimes these are mere coincidences. For example, a country's harvest may be poor at the same time that international prices soar. A natural hazard may affect production while producers – discouraged by low prices in previous years – have also reduced areas sown and the quantity of inputs used. This to some extent

is what happened in the Sahel in 2005 with the “locust crisis”. But the different causes may also be correlated and this increases the likelihood of multi-cause price rises and collapses. For example, natural instability in “large countries” is likely to engender unstable international prices, meaning that natural instability and imported instability are correlated: if a large importing country suffers a poor harvest, it imports rise, this drives up the international price, and therefore increases the import parity price in this country. Symmetrically, a bumper harvest in a large exporting country will drive the international price down. Also, shocks due to natural hazards tend to strengthen cobweb dynamics. For instance, drought that causes a poor harvest leads to price rises that may in turn lead to optimistic expectations, excessive producer responses and ultimately surplus production the next year.

As price instability of a given product in a given country can stem from different causes or even a combination of causes, this raises the question of how this or these cause(s) can be identified. Different methods have been developed for this purpose, but all are flawed.^[46] This means it is sometimes difficult to untangle the effect from the different potential causes (as illustrated by the many controversies surrounding the causes of the 2008 crisis). As certain instruments can only reduce certain types of instability (and may even, for some of them, increase other types of instability), the difficulties in identifying the cause(s) of price instability further complicate the choice of instruments to be used.

[46] *The first method consists in analyzing price series.* We know from the theory that the price series generated by natural hazards is random, whereas that produced by endogenous sources (cobweb, speculative bubbles, panics) is chaotic. However, imported instability may generate price series that are either random or chaotic, depending on the source of the international price instability (and that of exchange rates). This method cannot therefore separate imported instability from the other two types of instability. Also, according to Boussard (2007), existing “chaoticity” tests are not 100% reliable as they test chaos-related characteristics (such as “sensitivity to initial conditions”) that themselves also possess certain purely random series. Also, the cobweb tends to generate a negative autocorrelation of prices, whereas natural hazards, speculative bubbles and panics tend to induce a positive autocorrelation (Gouel, 2012). But here again, this method is not 100% reliable although it can give pointers. Strictly speaking, therefore, it is impossible to identify the main cause of the price instability on the sole basis of price series. *The second method relies on econometrical analyses that aim to explain price changes through changes in the variables that cause natural instability (climatic hazards) and imported instability (parity prices) and determine whether there is an unexplained residue* (Hazell et al., 2005). This method’s limitation is that it estimates endogenous instability only indirectly through the unexplained residue. *The third method consists in estimating endogenous instability through the endogenous variables that interact with prices*: for the cobweb, land area sown and quantity of inputs used; for speculative bubbles and panics, the quantities of food products bought and sold on the markets, stock levels and, for the specific case of futures markets, the quantity of contracts held and traded by non-commercial operators. Finally, *the fourth method consists in using dedicated instruments* (see the next section on generic and dedicated instruments) as “revealers” of the main cause of instability. For example, trade liberalization is known to have a stabilizing effect if the price instability is mainly natural (for it connects together a multitude of production areas that are sufficiently far apart for natural hazards not to be correlated), but a destabilizing effect if the instability is due mainly to the cobweb effect. Hence, if the level of international price instability is compared between different periods in the past that were more or less protectionist, this should point to the main cause of international price instability.

Designing effective price stabilization schemes: distinction between "generic" and "dedicated" instruments

If we are to overcome the difficulties induced by multiple causes and the problems related to their identification, we must make a distinction between "generic" and "dedicated" instruments. We shall call all instruments that tackle several sources of instability "generic instruments". More precisely, we will say that an instrument is generic with respect to instability types x and y if it has a stabilizing effect both when price instability is mainly of type x and when it is mainly of type y. By contrast, an instrument is said to be "dedicated" if it has a stabilizing effect only when facing one of these types of instability. If, in addition, it has a destabilizing effect when facing the other type of instability, we shall say that it is "strongly dedicated". For instance, all the instruments designed to strengthen the connection between the domestic market and the international market^[47] are "strongly dedicated" instruments. They reduce a country's vulnerability to natural instability and the cobweb, but increase its exposure to imported instability.

The idea is therefore to prefer generic instruments. As these instruments can tackle several causes of instability, there is no problem if several causes are involved or if they cannot be clearly identified. For example, public interventions based on public stocks or on import and export regulation can reduce price instability whatever its cause (natural instability, cobweb, speculative bubbles, panics and imported instability).^[48]

The scheme can be further supplemented by recourse to "weakly dedicated" instruments that reduce some of the types of instability without worsening the others. They can therefore tackle part of the problem. Instruments that deal with market modernization are usually weakly dedicated for by boosting stocks and improving spatial arbitrage on the domestic market they tackle the natural component of price instability without affecting imported instability.

"Strongly dedicated" instruments should be avoided for although they have a beneficial effect on certain types of instability, they have an amplifying effect on others, and their net effect may be weak (or even negative). Examples of this include conjunctural agricultural stimulus packages and all related measures (such as the proposal to build up land reserves that may be used only in the event of soaring prices).

[47] We are referring mainly to free trade measures, roads to reduce transport costs between ports and a country's interior, and actions taken to render local food products more "tradable" on the international market (such as grading systems).

[48] It should be noted that fixed import tariffs are "strongly dedicated" instruments (they reduce imported instability but increase natural instability), whereas variable tariffs are "generic" for, if properly used, they have a stabilizing effect on both natural instability and imported instability.

By applying these principles to the different instruments analyzed in sections 1.3.2, it is possible to design consistent schemes that are able to tackle all the causes of price instability. We will now examine the main features and components of these schemes in detail and will see later (1.5.2) how this “standard model” can be adjusted to include the specificities of different countries and products.

The standard model: price stabilization schemes resting on four pillars

We have shown that if price instability, regardless of cause, is to be reduced, then price stabilization schemes must combine stabilization strategies based on the market (strategy A) and on public interventions (strategy C).^[49] As strategy A may be broken down into three components (modernize production, modernize markets and improve the quality of expectations), the stabilization scheme must rest on four pillars:

Pillar 1: Instruments intended to modernize production

These instruments are intended to stimulate producer investment. They include:

- *public goods* (research and extension services);
- *temporary input subsidies* (seeds, fertilizers, pesticides) to facilitate producer access to more intensive production techniques;
- *private or public instruments that aim to protect producers from falls in productive capacity due to falls in income* (price risk and harvest risk management tools, credit, safety nets).

The first two instruments render production less sensitive to natural hazards and more responsive to price rises and, as such, have a stabilizing effect on natural instability and, to a certain extent, on speculative bubbles and panics (though here the effect is weak due to production lags).^[50] The third instrument is intended to reduce the effects of price or harvest instability on farmers’ productive capacity (these effects generally amplify price instability, regardless of whether this is of a natural origin or due to the cobweb).

[49] In addition, although this is not their primary aim, B-instruments and D-instruments can sometimes (slightly) contribute to price stabilization. This is particularly the case when price drops or poor harvests compromise the productive capacity of some small actors. Here, as already mentioned, if they can restore this productive capacity, these B-instruments and D-instruments will have a stabilizing effect on prices. This is the third component of pillar 1.

[50] By contrast, they tend to amplify cobweb dynamics, though this does not throw doubt on their soundness. These instruments are necessary to modernize production, a desirable goal in itself, for this modernization, whatever its effect on price instability, is necessary to reduce food costs and release labor for other sectors of the economy. Today, the “structural transformation of agriculture” is increasingly considered as a necessary step in a country’s development (Timmer, 1988 and 2009; World Bank, 2007; De Janvry, 2009). And stimulating green revolutions is therefore one of the main goals of price stabilization.

1. Developing a strategy to manage food price instability

Pillar 2: Instruments intended to modernize markets

These instruments are intended to stimulate spatial arbitrage (trade) and temporal arbitrage (private storage). They include:

- *the public goods necessary for markets to operate correctly* (legal framework, transport infrastructure, control of balances, certifier accreditation, etc.);
- *temporary subsidies for certain instruments* such that they reach the critical size required to develop and enable other market instruments to develop more easily (overcoming circularity problems).

These instruments reduce natural instability given that trade between regions that are sufficiently far apart for natural hazards not to be correlated will diversify risks (deficits in some regions will be compensated by surpluses in others). Storage in principle can be used to compensate the deficits of certain years by the surpluses of previous years, even though it is unlikely that stock volumes will be sufficient to mitigate significantly the effect of a poor harvest. By contrast, these instruments have little effect on the other types of instability (imported instability, cobweb). Subsidies are necessary because the development of market instruments is often hindered by "circularities". A market actor's drive to use an instrument often depends on the extent to which this instrument is used by others and also, sometimes, the existence of other instruments.

Pillar 3: Instruments based on the provision of information to improve expectations

These instruments are intended to reduce the expectation instability of economic actors. Key is the provision of the following:

- *harvest forecasts;*
- *prospective analyses of changes in the international market;*
- *stock estimates;*
- *data on policies and their likely effects on prices.*

These instruments are intended to reduce all forms of endogenous instability (cobweb, speculative bubbles and panics). They are also likely to strengthen temporal arbitrage and are thus complementary to pillar 2 instruments. The production and dissemination of this information could be entrusted to regional and national MIS with support from international organizations (namely International Grain Council [IGC] and the Food and Agricultural Organization's Global Information and Early Warning System [GIEWS]). Their support is especially needed for prospective analyses of changes in the international market.

Pillar 4: Instruments based on public interventions to hold prices within a predefined band

These instruments aim to regulate the quantity available on the domestic market such that prices are held within a predefined band. This may include (depending on country and product):

- *public stocks;*
- *variable import and export tariffs or subsidies;*
- *variable import and export quotas.*

These instruments are generic and therefore have multiple roles to play. *With regard to natural instability*, they aim to *i*) compensate for current weaknesses in production systems and markets, *ii*) stimulate production and market modernization (by reducing the risk faced by producers and traders, encouraging them to store and invest), and *iii*) prevent prices from reaching excessively high values, even after production and markets have been modernized. Pillar 4 instruments are therefore highly complementary to pillar 1 and 2 instruments. Only pillar 4 instruments can be effective in tackling *imported instability*. *Against endogenous instability*, pillar 4 instruments play both a preventive role (by stabilizing expectations and thereby discouraging the emergence of speculative bubbles, panics and cobweb dynamics) and a curative role (interventions to halt runaway prices). In order not to prevent the market from playing its role, public interventions should tackle only extreme values, leaving the price free to fluctuate as long as it remains within the predefined price band. The bounds of this band (floor price and ceiling price) must be set realistically and must be known to market actors in advance. We will return to this subject in more detail later (see 1.5.3.).

The price stabilization scheme must of course be adjusted to match a country's progress along the development path. *The first step* is where the country has not yet achieved its green revolution and has under-performing market institutions. The full scheme is needed here both to protect consumers and stimulate the investments necessary for production and market modernization. *The second step* is where the country has managed to modernize its agriculture (both production structures and markets). In this case, pillars 1 and 2 can be lightened (particularly by doing away with subsidies for inputs and market institutions) and pillar 4 can also be lightened: although the ceiling price must be maintained (to protect consumers), the floor price can be gradually lowered,^[51] then discarded. Finally, once the country's economic development

[51] Not too rapidly in order to facilitate the redeployment of agricultural labor by regulating the rate at which people leave agriculture

results in staple food products accounting for only a small proportion of household expenditures, the ceiling price may in turn be abandoned. This is the *third step* where public interventions to stabilize prices are in theory no longer necessary.

Here it should be underlined that although stabilization (using A- and C-instruments) is a necessity in DCs, it is not sufficient to tackle all the problems generated by price instability of basic food products: the scheme needs to be supplemented by lending D-instruments and B-instruments a new role (see 1.4).

1.4. Beyond stabilization: price instability management schemes

1.4.1. A new role for D-instruments

Stabilizing the price of basic food products is not enough. If food security is to be guaranteed, then a fifth pillar needs to be added to the scheme for transfers to vulnerable households (strategy D). As we shall now see, these targeted interventions must in part be structural and this constitutes a new role for D-instruments.

D-instruments have long been thought of as food crisis management tools. Given that crises were perceived as resulting from a problem of physical availability (stemming from poor harvests), D-instruments were chosen to provide emergency aid in food products, targeting rural households in "deficit" or "at risk" areas. Aid was triggered mainly based on grain balance sheets.

The general philosophy of D-instruments has gradually evolved under the influence of two factors: increasing awareness of the perverse effects aid may have, and increasing recourse to a definition of food security that goes beyond the question of physical availability to encompass problems of access to food. As D-instruments were conventionally based on aid in kind, public interventions sometimes drove prices down, harming producers. This was particularly troublesome when too much aid was provided, or when it arrived in the wrong place or at the wrong time. Moreover, beyond its short-term effect on producer and trader incomes, aid sometimes discouraged investment in market infrastructures and institutions (particularly those related to storage): like C-instruments, if poorly managed, D-instruments can harm the development of A-instruments. Dealing with the perverse effects of aid led the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) and the *Club du Sahel* to draw up a Charter for Food Crisis Prevention and Management (signed in 1990). More generally, the willingness to reduce distortions and recognize that food crises

are not always caused by problems of physical availability but also by problems of access, has led to the increasing importance of monetary aid, where rather than giving vulnerable households food, they are given cash or food vouchers.^[52] It has also focused a great deal of attention on the question of targeting, and on occasion has even led to “targeting obsession”, *i.e.* excessive targeting that is both costly and excludes some vulnerable households in need of help (see 2.4. for a more in-depth examination of targeting-related questions).

The 2005 food crisis in the Sahel countries (particularly in Niger) highlighted a new dimension of the problem: that of the reduction in household resilience due to recurrent grain price crises. This problem is particularly acute in the regions where the frequency of these crises is high such as the Horn of Africa and the Sahel (for instance, over the last 10 years, Niger suffered grain price spikes in 2002, 2005, 2008, 2010 and 2012). Grain price spikes generate both a reduction in the food consumption of the poorest households (affecting the health and even the life of some of their members)^[53] and a reduction in the capital and resilience of a large proportion of urban and rural households. In fact, many households, in order to maintain their food consumption levels when prices rise, have to sell some of the few assets they possess or reduce their investment in human capital (health expenditures, education). This increases their vulnerability to future crises as they have less capacity to respond to shocks (reduced savings, decreased productive capital and reduced human capital) and as some of their members – whose health has been affected by cuts in health expenditures – are more susceptible to reduced food consumption. By highlighting how D-instruments were unable to prevent household decapitalization (although they succeeded to some extent in maintaining household food consumption levels), the 2005 Niger food crisis engendered a D-instruments crisis (Michiels *et al.*, 2008; Michiels and Egg, 2008; Blein and Egg, 2009). The main consequence of household decapitalization is that a fairly moderate shock is sufficient to cause major food and nutritional problems. As a result, the cost of managing crises increases with time, thus questioning the sustainability of the standard crisis management model which is based only on the emergency use of D-instruments (in fact, the cost of managing

[52] When crises were perceived as arising from a deficit in physical availabilities, aid in kind received from donors was resold by governments at the market price, and this limited its distorting effect. The increasing focus (since the late 1990s) on household problems of access to food has led to new approaches – such as distribution of free or moderately priced food – that tend to render aid in kind more distorting. Monetary aid is therefore a means to take problems of access into account without generating too much distortion.

[53] For the poorest of the poor, this reduction may mean a deficit in caloric intake. For other households, it may mean a reduction in food diversity, these households being forced to reduce their consumption of oil, vegetables or meat in order to maintain their grain consumption.

the Niger 2010 food crisis was twice that of managing the 2005 crisis in the same country).

The solution would appear to lie in broadening the scope of D-instruments by using them not only in times of crisis (as emergency tools) but also in a structural manner to rebuild household capacities and thus strengthen their resilience. This means implementing medium- and long-term programs that every year transfer cash or assets to vulnerable households. Programs such as these have already been used in East Africa, for example through European Union actions in Malawi (*Social Cash Transfers*) and in Ethiopia (*Productive Safety Net Programme*). Such programs are indispensable for although price stabilization can prevent certain households from falling into the poverty trap, it cannot help those already in it.

Another potential structural effect of D-instruments lies in their capacity to strengthen market development. The idea here is not only that D-instruments must not disturb markets, but also that they must facilitate their modernization. D-instruments can help develop markets in several ways. Firstly, by recourse to cash transfers rather than to aid in kind. Consumers who otherwise would have been insolvent are in this way connected to the market. However, this is only possible if markets function correctly and are sufficiently supplied. When this is not the case, aid in kind is still necessary. States and aid agencies can sometimes procure grain and other food products in other developing countries (see for instance the *Purchase for Progress* program developed by the World Food Programme [WFP]). This is the second way in which D-instruments can promote market modernization as these purchases can help develop market institutions, for example by the dissemination of quality standards, the development of a “culture” of compliance with contracts and improved producer and trader access to credit. But this often leads to a market within the market, with a few actors specializing in supplying aid agencies. This problem could perhaps be resolved by the use of warehouse receipt systems whereby aid agencies procure their grain by purchasing warehouse receipts (possibly through commodity exchanges if such structures exist).^[54] The WFP already uses this system in certain African countries such as Ethiopia and Zambia. Were aid agencies to develop such practices, this would have the effect of both aligning their quality criteria with those of the market (those used by warehouse receipt systems) and opening up their supply market to a larger proportion of actors.

[54] For more details on warehouse receipt systems and their links with commodity exchanges, see 2.1.

The structural role of D-instruments must go beyond household recapitalization and the development of food markets. In cases where green revolutions have been successful, certain households will specialize, invest, increase their yields, and produce more, whereas others will no longer be competitive and will have to leave agriculture (partially or entirely). Vulnerable households often belong to the second category. A long-term vision of D-instruments must therefore consider their role in preparing this transition through actions that aim to diversify the activities of vulnerable households, their sources of income and connect them with the (rural or urban) labor market.

Emergency and structural D-instruments constitute the 5th pillar of food price instability management schemes. And here we may add that, as well as supporting vulnerable households, D-instruments may also play a role on the international scale, helping countries in difficulty. This point will be addressed later (1.6.1.). For the moment, let us consider the new role of B-instruments.

1.4.2. A new role for B-instruments

If successful, stabilization will reduce price instability, but will not make it disappear. Also, production variability remains. Thus, it still makes sense to promote price risk and production risk hedging instruments. New promising instruments (such as weather-indexed insurance) could lead to B-instruments being more often used by market actors. But, we must not delude ourselves, in DCs only a small minority of food producers and traders will have access to these instruments. History teaches us that it is only when the modernization of agriculture is well advanced that producers are able to use B-instruments.

In addition, some experts entrust B-instruments with a new role: that of enabling countries, States and aid agencies to protect themselves from the consequences of price instability. And this particularly given that price instability can, in certain countries, cause macroeconomic imbalances. This in particular is the case for importing countries that have low foreign exchange reserves. For these countries, any increase in the food imports bill caused by soaring international prices or a poor domestic harvest (obliging the country to import more) may well lead to import rationing and a fall in the exchange rate. The governments of these countries can use B-instruments to hedge this risk, particularly weather insurance or instruments that safeguard against price risk such as futures or options (Sarris *et al.*, 2011). States (or donors) can also turn to B-instruments because price stabilization policies (based on C-instruments) or public interventions intended to support vulnerable groups during a crisis (emergency D-instruments) may result in a transfer of the instability to their budget. Here again, the State (or donors)

may find recourse to B-instruments useful (Faruqee *et al.*, 1997; Dana *et al.*, 2006 and 2007). Although interesting, the idea has its limits. For instance, certain products (such as rice) do not have a futures market worthy of the name, and this prevents such a policy from being enacted. Also, even when futures markets do exist, a basis risk remains due to the fact that the price of imported grain is only partially correlated with prices on the futures markets (because of quality differences and transport costs). In actual fact, until now, very few cases of governments or donors using B-instruments have been reported. To the best of our knowledge, the only three cases consist of the use of a call option on white maize by the government of Malawi (in 2005), the taking out of weather risk insurance by the WFP to cover itself against the risk of a poor harvest in Ethiopia (in 2006), and the purchase of maize futures on the Chicago Board of Trade by the Mexican government (in 2010). The extent to which these were successful and reproducible will be discussed later (see 2.2.).

Strategy B therefore has a valuable role to play in the price instability management scheme (even though it no longer plays a leading part as was the case in the “optimal strategy”).

We have thus managed to come up with a price instability management scheme that rests on six pillars. It mobilizes four strategies: strategy A that calls on pillars 1 to 3, and strategies C, D and B that are implemented by pillars 4, 5 and 6, respectively. We will now further refine this scheme’s design by discussing the conditions of its implementation.

1.5. Implementing price instability management schemes

The efficiency of price instability management schemes is to a great extent dependent upon the manner in which they are implemented. This is why we will now consider how to choose the relevant scale (national and/or regional) for scheme implementation, how to adapt it to country/region and product specificities, and how to define rules that guarantee good governance.

1.5.1. *Choosing the scale of the intervention: are regional schemes better?*

Price instability management schemes have nearly always been designed for and implemented at a national scale.^[55] Yet, the idea of a regional approach is increasingly

[55] With the notable exception of the European Union.

attracting interest. This idea is based on the fact that thanks to regional trade, the food markets in different countries belonging to a particular region (West Africa, East Africa, etc.) are very often highly interconnected. However, the arguments are quite different when considering market modernization (strategy A) or public interventions (strategies C and D).

For market modernization, the regional approach appears to be doubly relevant. First, the larger the scale of the spatial arbitrage, the greater the price stabilizing effect. Indeed, the further apart the production areas brought into connection, the less correlated the natural hazards and the more different the harvest dates are likely to be. This therefore further diversifies climatic risk and mitigates seasonality. Second, economies of scale are made not only in infrastructure (such as roads), but also in market institutions such as grading systems, warehouse receipt systems and commodity exchanges. Initiatives developed by the Eastern Africa Grain Council for white maize are a good example of such a regional approach (see box 7).

For public interventions, the main argument in favor of the regional scale is that the borders between neighboring countries are porous, and this generates spillover effects. Stabilization policies developed in one country run the risk of generating a price differential between this country and its neighbors (particularly if the price instability is correlated between these countries, as is the case for imported instability or large-scale natural hazards). In this case a country's efforts to stabilize its prices may well be cancelled out by a leakage of food products into neighboring countries, or conversely by an inflow of products from these countries (in some cases through re-export trade, as in the notorious case of rice re-export from Benin to Nigeria). The same problem arises to some extent for interventions that target vulnerable households, with subsidized products sometimes being re-sold in neighboring countries. Implementing the schemes on a regional scale could possibly solve this problem. The basis of such schemes is some cases already exists, such as the common external tariff of the West African Economic and Monetary Union (UEMOA). Some Regional Economic Communities such as the Economic Community of West African States (ECOWAS) and the group ASEAN + 3 have already signaled their intention to develop regional policies to reduce grain price instability or mitigate its effects. The choice of regional scale for implementing agricultural and food policies is also in tune with the approach defended by the New Partnership for Africa's Development (NEPAD).

However, the regional scale also has disadvantages as it requires collective action and is therefore prone to huge problems of governance. These problems are accentuated if the various countries have diverging interests. But whatever the scale decided

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(national, regional or mixed),^[56] the scheme always has to be adapted to the specificities of that area.

1.5.2. Adapting the scheme to national or regional specificities

The scheme must be adapted to take account of specificities stemming from the product and the country/region. Firstly, the weight of the different causes of price instability is not the same in different countries and thus, whereas an instrument may be crucial in one country, it may be of negligible importance in another. Secondly, certain countries are more exposed than others to “mixed” instability, *i.e.* instability resulting from a combination of causes. And, as we shall see below, this kind of instability generates specific problems, in particular it renders the stabilization more costly. Thirdly, the consequences of price instability are also very different depending on a country’s current position along its development path. Some have already accomplished their green revolution and exhausted potential productivity gains. For them, the stakes of price stabilization are different. Finally, as certain instruments may be difficult or costly to use, depending on country and product, only a subset of the instruments theoretically available can in practice be mobilized in any given country. We will now consider these four points.

Adapting the scheme in relation to exposure to different types of instability

Certain countries are obviously more exposed to certain types of instability. For example, natural instability is more pronounced in countries prone to drought (because of highly unstable production), in landlocked countries and in countries where the main grains produced and consumed are non-tradable and difficult to substitute for tradable grains (because the parity price band is very broad). Some countries are more exposed than others to speculation and panics (*e.g.* if there is little or no competition in their grain market). This has implications for the scheme: for instance, countries highly exposed to natural instability must lend far more importance to modernizing their production and markets (pillars 1 and 2).

Adapting the scheme in relation to exposure to mixed forms of instability

These situations pose a specific problem: they render the instruments more expensive. We have already seen that natural instability may feed the cobweb by causing price fluctuations that in turn cause expectation instability. Therefore, countries subject

[56] Schemes may also be implemented *on an infra-national scale*. Mali’s experience in this field is interesting as each of its 703 municipalities has been provided with a buffer stock. But spillover effects are very marked on this scale as there are no borders between the different municipalities.

to major natural hazards (e.g. drought areas) and whose production is very responsive to prices (land and labor availability, access to intensification), are likely to experience "mixed" instability of the "natural + cobweb" form. Production and price fluctuations in these countries are substantial, and greatly increase the cost of stabilization (for example public stocks have to be increased in size or large amounts of grain need to be imported with subsidies). Happily, not many countries possess these two characteristics.

Likewise, if a country suffers a poor harvest at the same time that the price soars on the international market, the stabilization cost will be very high given that large quantities will need to be imported (to make up for domestic production deficits) while conceding very major tariff reductions or subsidies (to compensate for the rise in the international price). An alternative solution would be to constitute major public stocks sufficient to make up for production deficits without recourse to the international market, but this solution again is very costly. From being "accidental" in "small countries", a concomitant poor harvest and high international price becomes fairly likely for "large countries" given that, for these countries, a poor harvest causes imports to rise sufficiently to drive up the international price.

Another situation where natural instability leads to imported instability occurs in countries whose grain imports weigh significantly on their balance of payments. In this case, a poor harvest leading to a rise in imports causes the exchange rate to fall and ultimately results in an increased import parity price. Each poor harvest therefore causes a substantial increase in the cost of stabilization given that it causes a simultaneous increase in volumes imported (to make up for production deficits) and in the cost of each tonne imported (due to a fall in the exchange rate).

As the concomitant occurrence of several causes of instability increases the cost of stabilization, it is wise for governments of countries exposed to mixed forms of instability to supplement the scheme by hedging risk through weather insurance, or by recourse to futures markets (pillar 6). Technical and financial support from the international community is doubtless necessary to help the governments of these countries use these instruments. But appropriate B-instruments are not always available. For example, rice does not have a futures market worthy of the name. This is why public compensations (through D-instruments) may also be envisaged on an international scale to protect those developing countries facing mixed forms of instability (see 1.6.1.).

Adapting the scheme in relation to a country's position along its development path

With a country's agricultural development then general development, the weight of the different causes of instability changes. The modernization of agricultural production together with urbanization, growth in market size (due to the decrease in self-consumption), increased product processing and market modernization, all mean that the weight of natural instability tends to decrease. By contrast, the fact that production is increasingly able to respond to price incentives strengthens cobweb dynamics. If, in addition, market modernization and the development of processing make products more tradable or more substitutable with tradable products, this may also increase imported instability.^[57]

The development dynamics of countries also modifies the consequences of price instability and therefore the relative weight that should be given to the different pillars. *For countries characterized by low productivity agriculture and where food products account for a large share of household expenditures*, food price instability impacts greatly on both producers and consumers. In this situation (which is that facing the huge majority of developing countries), efforts are necessary to stimulate investment in agriculture by providing public goods and subsidies (pillars 1 and 2) and guaranteeing a floor price (pillar 4). Efforts are also needed to protect consumers by holding the price under a ceiling (pillar 4) and by transferring food, cash or assets to vulnerable households both in times of crisis and in a structural manner to rebuild their capacities and increase their resilience (pillar 5). Price instability has far less impact in *countries that have already completed their green revolution* as massive investment is no longer necessary, the simple renewal of worn-out or obsolete equipment being sufficient. There is no longer any need to subsidize inputs or market tools: pillars 1 and 2 can now be limited to the provision of public goods. The floor price can gradually be lowered then abolished (lightening pillar 4).^[58] Farmers are then able to use crop insurance, futures markets and other B-instruments (pillar 6). But a ceiling price and (emergency and structural) transfers are still necessary to protect vulnerable consumers against price surges. Finally, *for countries that are sufficiently advanced in their development*

[57] For instance, in West Africa, growing urbanization will probably drive the processing of millet, sorghum and maize (to reduce their preparation time). This trend is likely to increase their substitutability with rice that is rapid to prepare, currently making it the ideal cereal for the midday meal. The connection with the international market would therefore be strengthened, with the price of millet, sorghum and maize being more linked to that of imported rice. The same trend may occur for roots and tubers (yam and cassava).

[58] This reduction in the floor price must be gradual in order to adjust the flow of labor leaving agriculture to the rate at which non-agricultural activities are developing.

trajectory, food accounts for only a small part of household expenditures. Here, food price stabilization is not of any practical use and the ceiling price in its turn can be abolished (pillar 4 removed). Targeted transfers are still necessary to protect vulnerable households but only in their structural form: emergency aid is no longer required because the country no longer suffers food crises, except in situations of major political unrest (pillar 5 lightened). Note that pillar 3 (based on the provision of information to improve expectations) is relevant for all stages of economic development.

Adapting the scheme in relation to instrument cost and effectiveness in a given context

Instrument cost and effectiveness depend on the context, and thus on the country and the product.

Product characteristics may make it difficult or even impossible to use certain instruments. Product perishability will determine its capacity to be stored. Its "tradability" or its substitutability with tradable goods will determine whether or not the international market can be used to stabilize the product's price.

Country characteristics are also crucial. Firstly, the resources available in the State budget determine to what extent and for how long instruments can be used. Secondly, the State's capacity to implement and enforce policies on the ground (for instance, its capacity to collect taxes and control national borders despite corruption and efforts by private operators to side-step these policies) determines the effectiveness of public interventions (pillars 4 and 5). The country's international commitments (membership of WTO, or of a customs union or a free-trade area) also play an important role by restricting which instruments are permitted for purposes of regulating imports and exports. Moreover, the country's foreign exchange reserves may restrict its import capacity. Finally, the degree to which a country is landlocked shapes its capacity to use the international market to stabilize domestic prices.

The characteristics of a given product in a given country also play a decisive role. Producer access to production factors (land and labor) and to intensive production techniques determines to what extent domestic production can respond to price incentives. Whether the country is "small" or "large" determines its capacity to use the international market to stabilize domestic prices (for if the country is "large" then internal deficits correlate with rises on the international market). The fact that a country is close to self-sufficiency, or is greatly in surplus or in deficit, determines its capacity to protect itself from imported instability by disconnection from the international market. Finally, the degree of competition in the domestic market (including the import-export sector) determines market capacity to play a stabilizing role.

Therefore, the characteristics of the product and the country should be taken into account when designing the price instability management scheme. In the short term, as the constraints induced by the characteristics of the product and the country reduce the effectiveness of certain instruments or increase their cost, they must be taken into account as criteria in the choice of instruments to be used. In the medium term, some of these constraints may disappear, or may be lifted by suitable policies. This in particular is the case for product perishability (that may be reduced by processing or recourse to specific storage techniques), for product tradability (that may be improved by developing grading systems and warehouse receipt systems), product substitutability (that may on occasion be enhanced by processing) and the country's surplus or deficient nature (that can be changed by policies designed to stimulate investment in agriculture). Finally, other constraints cannot be removed without assistance from the international community, particularly WTO rules, import constraints stemming from a shortage of a particular country's foreign exchange reserves, or national budget constraints (see 1.6.).

However, the performance of a price instability management scheme does not depend only on its adaptation to its environment. It is also greatly dependent upon the manner in which it is managed.

1.5.3. *Guaranteeing good governance*

The scheme we propose is based on all four instrument categories (A, B, C and D). But the literature often pits C and D-instruments against A-instruments. The constant threat of a public intervention that is likely to drive prices down leads private actors to stock or import less. For example, public storage is thought to discourage private storage (Newbery and Stiglitz, 1981). This "crowding out effect" could ultimately lead to public interventions increasing (instead of decreasing) price instability. Situations of this type have already arisen and have been reported and analyzed (for the specific case of countries in East and Southern Africa, see Govereh *et al*, 2008, Chapoto and Jayne, 2009 and box 15 in this book). The problem is not only that public interventions run the risk of increasing price instability: they risk affecting producer and trader investments in A-instruments, and may thus block efforts to modernize production and markets. The development of warehouse receipt systems in certain countries was in this way obstructed by inappropriate State interventions (Coulter, 2005).

Should we conclude from this that the State must abstain from intervening so as not to hinder market functioning? Should we forgo pillar 4? The answer is no, for several reasons. Firstly because private instruments are ineffective when faced with imported

and endogenous instability, and insufficient in the face of natural instability. Secondly because a certain degree of stability is necessary to promote the modernization of agriculture (which in turn is a necessary step in economic development) and enhance food security. Finally because non-intervention is not a *credible* policy (Poulton *et al*, 2006): economic actors know that if prices rise steeply, pressure from the street will force the government to intervene. A State's commitment not to intervene on the market therefore will neither reassure economic actors nor remove the crowding out effect.

We are therefore encouraged to find ways to coordinate A-instruments with C- and D-instruments in a manner that ensures we are maximizing the positive interactions between them while minimizing negative interference.

The first key to this coordination is *transparency and predictability*. We have already mentioned that public interventions must be predictable if the crowding out effect is to be reduced. This has a range of implications. Firstly, interventions must be governed by rules. Secondly, these rules must be known to all. Thirdly, these rules must specify under what conditions the State will intervene. Fourthly, these conditions must concern variables that can be objectively measured, ideally variables that are known to all. *When State interventions aim to stabilize prices (through C-instruments)*, the simplest manner to fulfill these conditions is to establish a price band where public interventions are triggered only if the price falls below a certain floor or rises above a certain ceiling. These intervention prices must be known to all, making interventions predictable. The source used as a reference for the prices should also be specified (the best solution is often to adopt the prices given by MIS). ^[59] *For emergency interventions targeting vulnerable households (D-instruments)*, the solution is to select objective indicators that can be used to trigger aid. In practice, these indicators are provided by early warning systems and are built by crossing data such as harvest forecasts, grain prices and the terms of trade between grain and assets that deficit households can sell to buy grain, in particular small ruminants). ^[60] Recommendations

[59] Although intervention prices must be transparent, a more controversial question arises as to whether or not the resources devoted to the stabilization policy should also be transparent (i.e. stock volumes or budget). Some studies suggest that transparency on available resources increases the probability of speculative attacks against the stabilization policy (Salant, 1983). But transparency on resources may strengthen the policy's credibility (if these resources are substantial). Transparency may also avoid information asymmetries where certain actors close to the authorities have information not available to others.

[60] The current indicators employed to trigger D-instrument-based interventions are little suited to urban food insecurity for they rely on the concept of "risk area". Also, as they are based on high magnitude shocks on production or prices, they are of limited effectiveness in situations where households are so decapitalized that small shocks are enough to push them into the red.

1. Developing a strategy to manage food price instability

for rule-based governance have long been made for public policies in general (Kydland and Prescott, 1977) and for price stabilization policies in particular (McLaren, 1998). They are supported both by empirical analyses (Nijhoff *et al.*, 2002) and studies in experimental economics (Abbink *et al.*, 2011) that showed how unpredictable policies may increase price instability.

Concerning the coordination between A- and C-instruments, the second key is to *set the floor price and the ceiling price at appropriate levels*. This is an art: a floor price set too low is useless, whereas when set too high it is extremely expensive and compromises the financial sustainability of the stabilization scheme. Likewise, a ceiling price set too low will discourage private storage, whereas if set too high it will fail to protect consumers from malnutrition and decapitalization. The intervention price band must also be regularly updated in order to follow the long-term price trend. But here again, the right balance must be struck: a band that is too flexible is no longer of any benefit to market actors.^[61] Overall, stabilization that is excessively ambitious (too high floor price or too low ceiling price) or goes against the long-term market trend is destined to fail. The quality of the coordination between A- and C-instruments is therefore highly dependent upon the level of intervention prices and the way they are updated. Within the limits permitted by these technical considerations, parity prices depend on what prices are considered as “acceptable” in a given society both for consumers and producers. In view of this, it may be useful to associate market actors in the design of stabilization policies, namely in the setting of floor and ceiling prices. This can be achieved by setting up “discussion platforms” that bring together the State and representatives from the different market actor categories (producers, traders, processors and consumers). Several countries have already implemented this kind of forum (see box 16 on the case of Madagascar).

The third key to appropriate coordination between A-instruments and public interventions (based on C- or D-instruments) is the *credibility of the price instability management scheme*. Transparency will create predictability only if the policy announced is believed by market actors, and if it is effectively applied. But policy-makers may be tempted not to comply with the announced policy. For example, if prices rise, they may be tempted to intervene before the price has reached the announced ceiling. If market actors expect the government not to comply with announced intervention prices, they will at all times fear that a public intervention is

[61] On the international scale, the agreement on natural rubber illustrates the case of a band that was too broad and too flexible (Gilbert, 1996).

about to take place and drive prices down. They will therefore reduce their stocks (crowding out effect) and abstain from investing in the means required to modernize production, processing, infrastructure and market institutions. *How can intervention policies be made credible?* Credibility can only be built up over time, by the State delivering on its commitments. But it can be strengthened by setting up an independent agency charged with operating the price instability management scheme (following the model of central banks independent of governments). In this case, the rules of the stabilization policy (namely intervention prices) would be set by the State (preferably after discussions with representatives of market actors), whereas the policy would then be implemented (in compliance with the rules) by the price stabilization agency. This means that the agency would have to be given control over the various intervention instruments, namely public stocks and the tariff- or quota-based tools employed to regulate imports and exports. ^[62]

Finally, the fourth key is *control over collusion* between State agents and private operators. All public interventions are prone to collusion, whatever instrument is used. For example, the buying or selling of public stocks may be allocated preferentially to certain traders who are close to the authorities or have personal relationships with State agents. The same applies to import or export quotas. Collusion generates rents and distorts competition between market actors. The solution consists in allocating contracts or quotas by open, competitive and transparent procedures (calls for tender, auctions) as is already the case in certain countries.

Beyond the question of coordinating A-instruments with C- and D-instruments, one particular condition for the good governance of price instability management schemes concerns the use of monitoring and evaluation systems.

Monitoring is necessary to check that policies are actually implemented. In particular it ensures that directives are applied on the ground by State agents (such as customs officials) but also, in certain cases, by private actors. For example, reductions in import tariffs agreed by the State will only have an effect on prices if traders pass them on to the consumer. Hence the advantage of requiring tariff reductions to be conditioned by importers signing a contract (by which they undertake to pass reductions on to

[62] This model is a far cry from the current organization of price stabilization schemes. In most countries, the various instruments are in the hands of different bodies: ministry of trade for import and export tariffs and quotas, ministry of agriculture or marketing board for the management of public stocks. Also, government instructions to these bodies are usually discretionary: they do not concern the basic rules of interventions, but one-off interventions.

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their selling price), and the requirement to set up State-monitoring of a sample of stores to check whether importers are complying with their commitments.

Evaluation is necessary to ensure that the scheme is continually improved. This in particular requires the centralization of information about all interventions (timetable, instruments used and details on their implementation), the regular analysis of their impact on prices (based on MIS data) and food security, and the production of an annual report. This calls for the creation of a stabilization policy analysis unit (SPAU) that must obviously be independent of the agency charged with implementing the stabilization policy.

In short, the success of food price stabilization efforts depends on the quality of the governance of public interventions. Only interventions that are governed by rules and are predictable can be harmoniously coordinated with A-instruments. Price instability management schemes must also be accompanied by monitoring and evaluation systems.

Up to now we have focused on actions that may be taken by developing countries or Regional Economic Communities to manage food price instability. But the international community also has a role to play.

1.6. What role does the international community have to play?

The international community can help developing countries by supporting their food price instability management schemes (FPIMS), by reducing food price instability on international markets and by revisiting WTO rules. Let us consider these one by one.

1.6.1. Supporting developing countries' food price instability management schemes (FPIMS)

Food price instability poses an extremely serious problem for DCs. Firstly, it hits DC consumers hard as they often devote a large proportion of their income to the purchase of food. This generates serious *food security problems* (under-nutrition, malnutrition) and sometimes *political instability* (soaring prices in 2008 sparked riots in cities across some forty DCs). Producers are also affected. By making investment in agriculture a very risky undertaking, price instability *obstructs green revolutions*. As these green revolutions are a necessary step in economic development, this in turn is therefore brought to a halt. Finally, for certain importing countries rendered vulnerable by their

low foreign exchange reserves, price instability may also generate *macroeconomic problems* (import rationing, decrease in exchange rate).

The international community must therefore shoulder the major responsibility of helping DCs manage food price instability. It can help them by supporting safety nets and grain price stabilization policies, and by assisting DCs faced with difficulties paying their food import bill.

Supporting the development of multiannual safety nets that render vulnerable households in DCs more resilient

The 2005 crisis in the Sahel countries (and more particularly in Niger) showed that emergency aid (activated only in times of crisis) is not enough to protect vulnerable households from food insecurity. More structural aid is necessary to recapitalize poor households and increase their resilience to price shocks. This leads to the idea of setting up multiannual safety nets whereby every year assets are transferred to a number of households over a determined period of time.

Programs of this type are already operational in some countries (see for example the *Social Cash Transfers* program in Malawi and the *Productive Safety Net Programme* in Ethiopia). But programs of this type are few and far between, and those that do exist could advantageously be extended in terms of the number of households covered and the sums transferred. These programs have proved to be effective but their cost has prevented DCs from setting them up or giving them sufficient breadth. Help from the international community in setting up such safety nets is therefore vital.

Helping DCs implement effective grain price stabilization policies

Although multiannual safety nets and emergency aid are crucial to prevent or halt food crises, they are not enough. They are of limited effectiveness when used alone: targeting may prove costly and flawed (households requiring aid may not be covered). The problem increases if a large number of people need aid, as is the case with major price surges. *Action must therefore be taken on prices to reduce the amplitude of surges and thus render the safety nets more effective.* Also, although safety nets aim only to protect urban and rural consumers against price surges, *producers should also be protected against sharp falls in prices given that this is essential to stimulate investment and thus promote the modernization of DC agriculture.* Historically, for England in the 18th century, North America, the European Union (CAP), and Asian countries, green revolutions have almost always taken place thanks to schemes designed to stabilize grain prices on the domestic market (these policies – depending on the

1. Developing a strategy to manage food price instability

case – concerned maize, wheat or rice).^[63] The price of food staples must therefore be stabilized on DC internal markets.

The main obstacles to such policies in DCs are *i*) a lack of the technical skills required to implement effective stabilization policies, *ii*) a lack of funding for these policies (except for a few countries that possess mining resources, for example Zambia that was able to finance its maize price stabilization scheme thanks to revenue from copper), and *iii*) the weakness of governance structures for public policies. The first obstacle results in ineffective policies and the second in undersized policies. The third results in unpredictable public interventions that disturb markets and result in private actors abstaining from storing or importing food for fear of a public intervention that will cause prices to fall.

The first obstacle may be overcome by providing *technical assistance and by training local experts*. The second and third obstacles may be removed by creating a *competitive international fund to finance grain price stabilization policies in DCs*. Such a fund would ensure that grain price stabilization policies are no longer the preserve of a few countries with revenue from mining or other sources. Conditionalities would guarantee the good governance of these policies, particularly transparent intervention prices and compliance therewith. The fund would be competitive: it would finance only the best stabilization policy projects. The details of this mechanism remain to be specified, including country eligibility conditions and project selection procedure. The fund could start with a relatively small sum and initially finance a few pilot schemes in order to render the mechanism credible and attractive both for donors and DC governments.

Helping vulnerable DCs faced with difficulties paying their food imports bill

International price instability leads to sudden increases in the food bill paid by importing countries. Production instability (due to climate hazards or cobweb dynamics) may also increase the bill by causing sudden increases in import volumes. These increases in the imports bill may have dire consequences for some “vulnerable” countries, particularly those with very limited foreign exchange reserves or those whose grain imports account for a significant proportion of their balance of payments. In these cases a rise in the imports bill may cause the exchange rate to fall or result in import rationing.

[63] See Timmer (1997a) on the Indonesian case and Dorin and Landy (2009) on the Indian case.

External aid must be provided in such situations. This may take the conventional form of *food aid*. Or could constitute support for governments, *helping them use risk hedging instruments such as weather insurance, futures or options*. This strategy, however, does have certain limitations (no futures markets for certain products, basis risk). It has not been much used in the past despite the recommendations of many experts (Faruqee, 1997; Dana *et al*, 2006; Sarris *et al*, 2011). Malawi's experience in 2005 (often claimed to be a success) remains a very rare case. This country did not repeat the experience that was imitated only by the WFP in 2006 and by the Mexican government in December 2010 (see 2.2.). In any case, if efforts are to be made to promote this strategy, external technical and financial aid will be needed. External aid may also be provided through another B-instrument: *credit facilities*. The International Monetary Fund (IMF) has already proposed such facilities (Compensatory Financing Facility and Exogenous Shocks Facility) but – according to certain experts – these facilities are not enough and other mechanisms must be envisaged (IMF, 2003; Sarris, 2009). Finally, an alternative solution could be to set up a *public scheme to stabilize food import expenditures*. The mechanism (which could be called the food import expenditures stabilization scheme [STABIMP]) would draw its inspiration from experience gained with the export earnings stabilization scheme (STABEX) developed by the European Economic Community to stabilize the agricultural export earnings of African, Caribbean and Pacific (ACP) countries. This scheme could be reserved for low-income importing countries. STABEX and IMF payment facilities have already been the subject of comparative analyses (see for example Brun *et al*, 2001). Another solution would be to allow countries affected by price shocks to temporarily suspend debt servicing payments (Gilbert and Tabova, 2005). A critical assessment of these different instruments therefore appears to be necessary.

1.6.2. Reducing food price instability on international markets

The instability of food prices on international markets is a huge problem for many DCs. Firstly, it causes imported instability (like in 2008 and 2010) that most DCs are fairly ill equipped to manage. Secondly, it means that international markets can not be easily used to counter internal sources of instability.

International price instability must therefore be reduced. Two complementary policy types can be used to achieve this. The first consists in implementing specific policies to reduce each of the causes of the instability. The second consists in implementing storage-based policies that are able to buffer the effects of all causes. We will now consider these two.

Cause-specific policies

These policies focus on the main causes to which international price instability is attributed: lack of market transparency, excessive speculation on futures markets, the boom in biofuels (that creates a connection between energy prices and food prices), climate change (that enhances production instability), the cyclical nature of agricultural investment and land purchases by certain countries to guarantee their food self-sufficiency (this reduces available land in the country which sells or rents the land and makes international markets narrower and therefore more unstable).^[64] These different causes of instability can be managed by the following policies:

Enhancing the transparency and predictability of international markets. This means disseminating information about the current state and the dynamics of international markets: harvest forecasts, stock estimates by country, content and expected effects of policies that may impact international prices (policies implemented internationally, if any, and by the main exporters and importers). The production and dissemination of this information may be entrusted to international commodity organizations (e.g. the IGC for grain) in collaboration with the FAO's Global Information and Early Warning System [GIEWS] that already provides information on policies enacted in different countries (in addition to information on prices).^[65] This information could be made more accessible to DC governments and private actors were it to be forwarded by regional and national Market Information Systems [MIS]. In addition, these international organizations (IGC and GIEWS) could provide regional and national MIS with the support necessary to produce the more specific information countries need. This support could for example consist in supplementing international price data with data on freight costs and exchange rates in order to estimate or forecast parity prices.

Increasing the regulation of futures markets. The deregulation of futures markets (in particular US futures markets) between 1990 and 2010 made speculative bubbles more likely. The risk of speculative bubbles is intrinsic to futures markets (see 2.2.), but this risk is accentuated by the increasing market share of "non-commercial" operators, whose activities are booming thanks to deregulation of the futures markets. These operators are not involved in physical transactions: their main motivation for buying and selling futures and options based on agricultural commodities is to diversify

[64] As export bans affect price instability both on international and domestic markets, they are presented in the next section (1.6.3).

[65] G20 just made a fairly similar recommendation by proposing the creation of the Agricultural Market Information System (AMIS) housed at FAO and cooperating with IGC (see G20, 2011).

their portfolio. As they arbitrate between contracts based on agricultural commodities, minerals, metals, energy and securities, they can cause a bubble in commodities by shifting their positions if a crisis occurs in securities (according to some experts, this is what happened in 2008 with the subprime crisis). The link between agricultural and energy prices is further strengthened by the trade of indices based on baskets of energy and agricultural commodities. More regulation of the futures markets would appear to be the solution, though there is no consensus regarding the degree of optimal regulation or the tools that could be used to reach it. For example, although experts agree that position limits must be placed on non-commercial operators, they diverge on where this ceiling should be located. The proposal to very slightly tax transactions in order to discourage the very rapid buying and selling practiced by speculators (Tobin-type tax) has so far not found a very favorable echo with policy-makers. Last but not least, it should be noted that, given the interconnections between the world's different futures markets, global norms are needed to harmonize their regulation.

Creating "virtual" stocks for intervention in the futures markets in the event of speculative bubbles (Von Braun and Torero, 2008, 2009a and 2009b). This policy, like that outlined above, is designed to tackle speculative bubbles on futures markets. Its main advantage over regulation is that it does not restrict trade on the futures markets and therefore does not reduce the liquidity required for these markets to operate correctly. Its main disadvantages are: *i*) its cost (the authors recommend a fund of 12 to 20 billion USD, corresponding to 30 to 50% of grain volumes "normally" sold) and *ii*) the risk it entails (interventions based on virtual stocks could be the target of attacks by speculators). However, according to the proposal's authors, the scheme may not be excessively costly despite the large stock, as the mechanism relies simply on country commitments and does not involve any actual payments if it plays its expected dissuasive role. The scheme could nevertheless be subject to speculative attacks and lose a considerable amount of money.^[66] This scheme would also have to face other challenges: establishing and updating the intervention price band (for which the authors propose a novel mechanism, see 1.3.1) and enforcing country compliance with commitments (for which the authors propose use of the WTO dispute settlement mechanism).

[66] This in particular is the case if the speculative bubble also occurs on the physical market (stock retention). In such a situation the mechanism proposed by IFPRI's researchers (massive selling of futures) is very risky for greatly exposed to a cornering of the market: if the operators who are holding back their stocks massively buy the futures and demand product delivery, then the virtual stocks management scheme must buy the grain at a high price in order to fulfill its commitments.

Regulating national biofuel promotion policies. The development of biofuels has an ambiguous impact on food price instability. Firstly, it makes the demand for food products more elastic (more sensitive to food prices), which tends to have a stabilizing effect. Secondly, it makes the demand for food products sensitive to energy prices. A price rise in energy products is therefore liable to be passed on to food products. According to certain specialists, this is precisely what occurred in 2007-2008 (Christiaensen, 2009). As the production of biofuels is supported by States (mandates and subsidies), these can reduce their support in order to save part of the food products this industry uses. Some experts have suggested that this support should be reduced when food prices soar (Wright, 2010).

Bringing climate change talks to a successful conclusion. Greenhouse gas emissions are contributing to global warming. This will generate more pronounced weather hazards and more unstable agricultural production. If no international agreement is reached on restrictions, countries will have little incentive to develop policies to reduce greenhouse gas emissions.

Better coordinating agricultural cooperation policies. The aid received by the agricultural sector in developing countries often increases during periods of crisis. This aid then tapers off gradually until the next crisis occurs. This mechanism (which on an international scale is equivalent to a conjunctural agricultural stimulus package) may well cause "cycles" in agricultural investment (Timmer, 2010a). And this in turn may well contribute to international price instability (cobweb dynamics). Better coordination between agricultural cooperation policies could reduce this problem.

Regulating land purchasing. Many countries, after the 2008 crisis, turned to a strategy of food self-sufficiency. And to achieve this some countries purchased or rented land in other countries. This has become a phenomenon of massive proportions (Von Braun and Meinzen-Dick, 2009; Anseeuw *et al.*, 2012; <http://landportal.info/land-matrix>). In certain cases these operations can excessively reduce the amount of arable land available in the host country, and this can generate food security problems. More generally, these self-sufficiency strategies run the risk of rendering international markets even more narrow^[67] and therefore more unstable. International standards are therefore required to regulate these land investments.

[67] Today, only 10% of all grain produced worldwide is traded internationally.

Generic policies (based on stocks)

The main argument in favor of such policies lies in the fact that they may have a stabilizing effect *whatever the cause of the price instability* (natural instability, speculative bubbles, panics or the cobweb). This is a very positive point given the controversy surrounding the actual causes of international price instability (see the debates that arose out of the 2008 crisis). A number of stock-based policies can be envisaged, with the most ambitious being the creation of international stocks to hold grain prices within a predefined (evolving) band. But more modest storage policies are also possible.

Creating international stocks to hold wheat, maize and rice prices within predefined bands. In the same manner as on the national scale, the intervention price band would aim to render interventions predictable in order to avoid crowding out private storage. Floor prices and ceiling prices would be set at realistic levels and be regularly updated to follow long-term price trends (the easiest strategy here would be to index intervention prices on the moving average price of previous years). The main argument against this option lies in the experience gained with International Commodity Agreements (ICAs): the schemes set up in the 1950s, 1960s and 1970s to stabilize the price of sugar, tin, coffee and cocoa were all abandoned in the 1980s (OECD, 2011).^[68] At first sight, the failure of ICAs appears to support the idea that it is impossible to stabilize international prices. But, when examined more closely, it can be seen that these ICAs aimed more to support prices that stabilize them (Gilbert, 1996). Moreover, to a large extent, it is this aim that explains why certain agreements ultimately generated such surpluses that storage schemes found themselves on the verge of bankruptcy (as was the case for cacao) while others were dropped due to the diverging interests of producer and consumer countries (as was the case for coffee). The problem with grain is very different: here the aim is to reduce price instability, not raise the average price, and we cannot therefore deduce from the failure of ICAs that international price *stabilization* is impossible. Even though such a policy would undeniably face difficulties (cost of stocks, difficulties in fixing and updating the intervention price band, governance problems inherent to this type of international collective action), it nevertheless should be studied seriously.^[69]

Reaching an international agreement to maintain global grain stocks above a minimum level. This policy is less ambitious than that just covered: it does not aim to hold

[68] Today, the only survivor is the scheme designed (in 1980) to stabilize the price of natural rubber.

[69] A milder version of this policy consists not in building up an international stock but in coordinating the use of national or regional stocks over the crisis period.

grain prices within a predefined band, but simply to reduce the magnitude and frequency of price surges, which would already be quite an achievement. Its main advantage is that it would be easier to implement and operate.

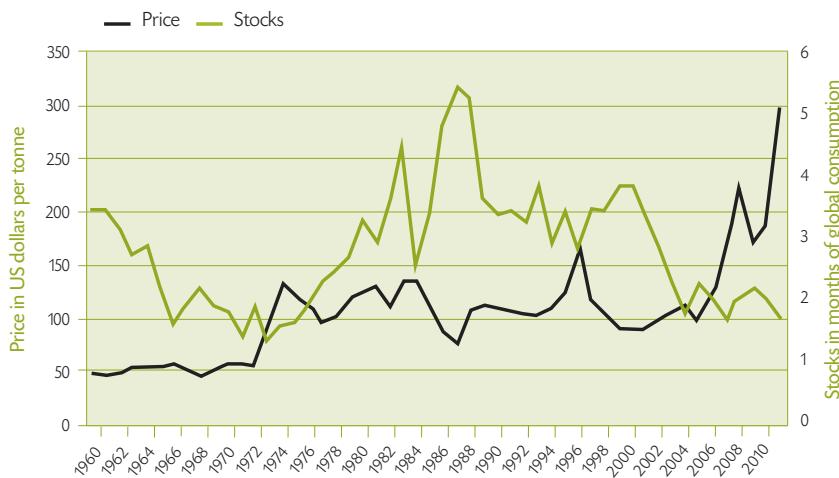
This policy is based on two simple ideas confirmed both theoretically and empirically: *i*) prices soar only when stocks are low and *ii*) private storage is suboptimal. The first idea is based on the fact that it is only when stocks are too low to buffer shocks that prices soar. This has been clearly demonstrated by storage models (Williams and Wright, 1991). It has also been confirmed by changes on grain markets since 1960: surges in the price of maize, wheat and rice on international markets have always occurred when global stocks were at abnormally low levels (see OECD, 2011 and figures 11 to 13). The second idea is based on another theoretical result: private storage is optimal only *i*) if storers are risk-neutral or – which comes to the same thing – if they are fully and freely covered for price-risk, and *ii*) if consumers are unaffected by the price instability because the product in question accounts for only a small proportion of their expenditures. These two hypotheses are far from being fulfilled in the case of grain. Producer and trader possibilities in terms of cover against price-risk are *i*) limited (rice does not have a futures market worthy of the name), *ii*) partial (for maize and wheat, there is a “basis risk” due to the imperfect correlation between prices on the futures markets and prices faced by market stakeholders in DCs because of quality differences and transport costs) and *iii*) costly. And no further demonstration is required of the weight of grain in the expenditures and the calorie intake of consumers in developing countries. The private storage of grain may therefore be said to be insufficient. As maintaining a minimum level of stocks would be enough to avoid price surges, this prompts the idea that some kind of public intervention is needed to increase the level of stocks.

This was in actual fact the case for a number of years, but almost accidentally when public grain stocks were generated as a by-product of agricultural policies. But these policies have changed (especially in the USA, the European Union and China), which is why global grain stocks have fallen sharply over the last few years (Mitchell and Le Vallée, 2005). For many authors, the increased instability of international prices since 2005 can be explained primarily by the low level of stocks. Public incentives would here be necessary to increase stock levels, but the problem is that each country, taken individually, has every interest in letting others shoulder the cost of global grain stocks.

An international agreement is therefore needed to share the storage burden between countries. This would increase global stock levels and guarantee that these do not fall below the minimum required to avoid overly frequent and substantial price surges.

The aim would be to set a minimum global stocks target (in terms of months of consumption). This minimum stock would need to be established for each grain (wheat, maize and rice) by an expert committee on the basis of past movements in the markets for these products. Country stock targets would then be set by spreading the effort between countries in a redistributive manner: the effort requested would increase with the country's income (it could be imagined that DCs would not be asked to make an effort whereas emerging countries would be asked to make a moderate effort and developed countries a greater effort). Countries would then be free to choose the policy they consider most appropriate to reach the target^[70] (subsidies for private stocks, subsidies for hedging tools, expansion of public stocks, etc.). Such a scheme would be much lighter than the international public stocks set up in the past to stabilize the price of cacao and other products. However, this would nonetheless be sufficient to reduce considerably the frequency and magnitude of price surges.

Figure 11 *Global stocks and international price of maize (1960-2010)*

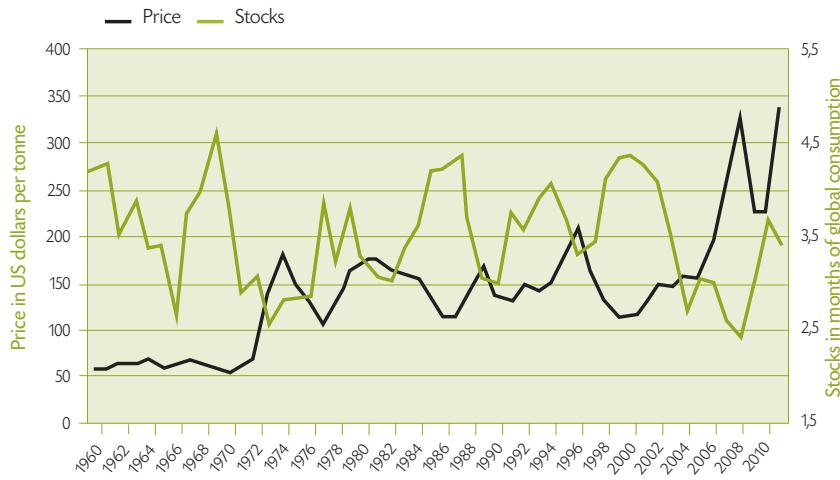


Sources: IMF for prices and USDA PSD for stocks.

[70] Similar to the type of agreement used for greenhouse gas emissions.

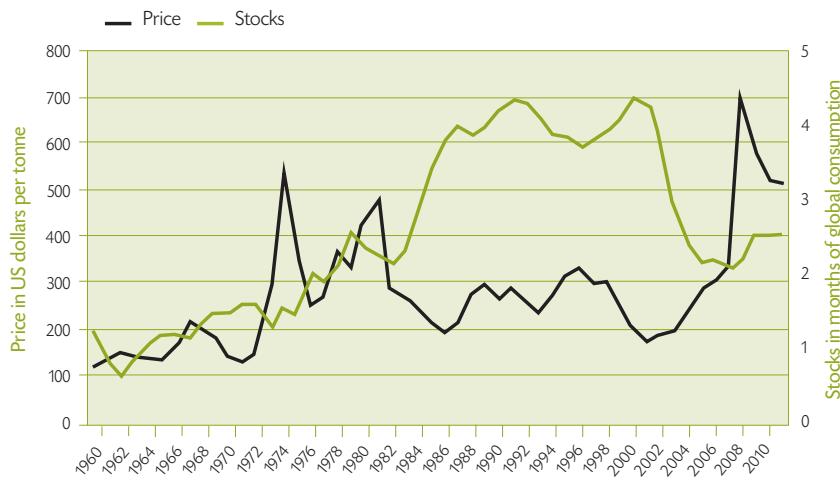
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Figure 12 Global stocks and international price of wheat (1960-2010)



Sources: IMF for prices and USDA PSD for stocks.

Figure 13 Global stocks and international price of rice (1960-2010)



Sources: IMF for prices and USDA PSD for stocks.

1.6.3. Revising WTO rules for a better balance between stabilization in DCs and on international markets

Trade policies are the only effective means available for DCs seeking to protect themselves from international price instability. For instance, importing countries may levy an import tariff indexed on international prices to compensate for the effects of turbulence on the international market. Likewise, exporting countries may restrict exports as the only means to prevent an international price surge from causing prices to soar on their domestic market.

But at the same time, *these trade policies may accentuate price instability on international markets.* For example, levying variable tariffs on imports means that the country's demand on the international market is insensitive to variations in international prices (and this tends to amplify these variations). But above all, if exports are restricted in response to price surges on the international market, this reduces supplies on this market, further increasing international prices (as happened in 2008: Headey and Fan, 2008 ; Christiaensen, 2009; Headey, 2011).

The role of the international community (through WTO rules) is therefore to balance these partially contradictory goals: allow developing countries to protect themselves from international price instability, without permitting them to overly accentuate this instability.

Unfortunately, current WTO rules are a long way from striking this balance. Sometimes they are too strict in that recourse to variable tariffs on imports is highly restricted: indexed tariffs are prohibited whereas *ad hoc* tariff variations are tolerated only on condition either that they remain below the "consolidated level" determined in 1994, or the country finds itself in the situation described by the "special safeguard clause".^[71] But it should be underlined that, in order to be effective, tariffs must be indexed. *Ad hoc* variations in tariff levels cause unpredictability and this discourages private actors from importing and storing and ultimately results in increased price instability (as illustrated by the experience of various Eastern and Southern African countries). Indexed tariffs are also more readily accepted by populations as they guarantee a certain reciprocity (producers will be less opposed to a decrease in import tariffs –when international prices rise- if they know that these tariffs will be raised should international prices fall). Moreover, the justification given for the prohibition on

[71] See 2.3. for more details on this point.

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indexed tariffs (they are supposed to increase the instability of international prices by rendering the demand of importing countries insensitive to variations in these prices) is not always relevant. For small, grain-importing countries (like most countries in Sub-Saharan Africa), this destabilizing effect on international markets is negligible whereas the stabilizing effect on consumer and producer prices in these countries has a huge impact on food security and agricultural investment. On the other hand, *WTO rules may sometimes be too lax*. They allow countries to restrict food exports to any extent they wish, and this can cause or very greatly accentuate international price surges.

WTO rules therefore need to be re-balanced. The idea is therefore to lift the prohibition on indexed tariffs for grain imports by small developing countries.^[72] At the same time, the right of exporting countries to restrict their grain exports should be limited to levels that ensure their domestic market is sufficiently supplied. In practical terms, export bans would be prohibited but export quotas would be authorized, with volumes based on estimates of a country's needs. Experience gained with food aid (where volumes are often based on such estimates) has shown that such an approach is possible though difficult ("grain balance sheets" give rise to heated discussions and controversy, but at the end of the day the different parties always manage to come to an agreement).

1.6.4. Conclusions on the role of the international community

The different fields of action given above are complementary, not exclusive. A solution must be found to food price instability *in DCs*, precisely where the consequences are most serious for consumers (food insecurity) and producers (green revolutions obstructed). Used in addition to emergency aid (necessary in certain cases), this solution must be based on safety nets, price stabilization policies and instruments that come to the assistance of vulnerable importing countries when these face difficulties paying their food imports bill. But national and regional price stabilization policies can prove difficult to implement if international prices are too unstable or if WTO rules are too strict. That is why specific actions are necessary *at the international scale* to prevent international price surges and allow countries to prevent international price instability impacting on their domestic prices.

[72] Here we use the term "small country" in its meaning given by the theory of international trade: a country whose import volumes are too small to affect the international price of the commodity considered.

In chapter 1 we analyzed the different strategies that may be used to manage food price instability in DCs. We first considered the possibility of "pure" (A, B, C and D) strategies, then analyzed the two main mixed strategies: the "optimal strategy" (combining B and D strategies) and the price stabilization strategy (based on a combination of A and C strategies). We concluded that the solution lies in a price instability management scheme based on all four instrument categories (A, B, C and D). It now remains for us to analyze in more detail the instruments to be employed to implement this scheme. This is dealt with in the second part of this book.

2. Selecting the right instruments for strategy implementation

In the first part of this book, we demonstrated the need for a price instability management scheme based on all four instrument categories (A, B, C and D). We also showed that the scheme needs to be adapted to the country or Regional Economic Community where it is implemented. Our aim now is to help decision makers choose the right instruments by describing the advantages, limitations, and perverse effects of the different instruments, along with the complementarities and substitutabilities between them.

In chapter 1, we distinguished between the four instrument categories by examining their goal (stabilize prices or reduce the effects of instability) and the means adopted to reach this goal (market development or recourse to public interventions). This led us to the “ABCD matrix” (see table 3):

Table 3 *Different categories of instruments to manage food price instability*

		Goal	
		Stabilize prices	Reduce the effects of price instability
Means	Market development	A-instruments	B-instruments
	Public interventions	C-instruments	D-instruments

Source: author.

A-instruments aim to stabilize prices by improving the performance of food markets, the term “market” being used here in its broad sense of a production and trade system. In other words, A-instruments aim to modernize production and markets in order to render them more responsive to price movements.

B-instruments aim to mitigate the effects of price instability on income (and thereafter on consumption and production). B-instruments concern credit and hedging tools (crop insurance, futures markets).

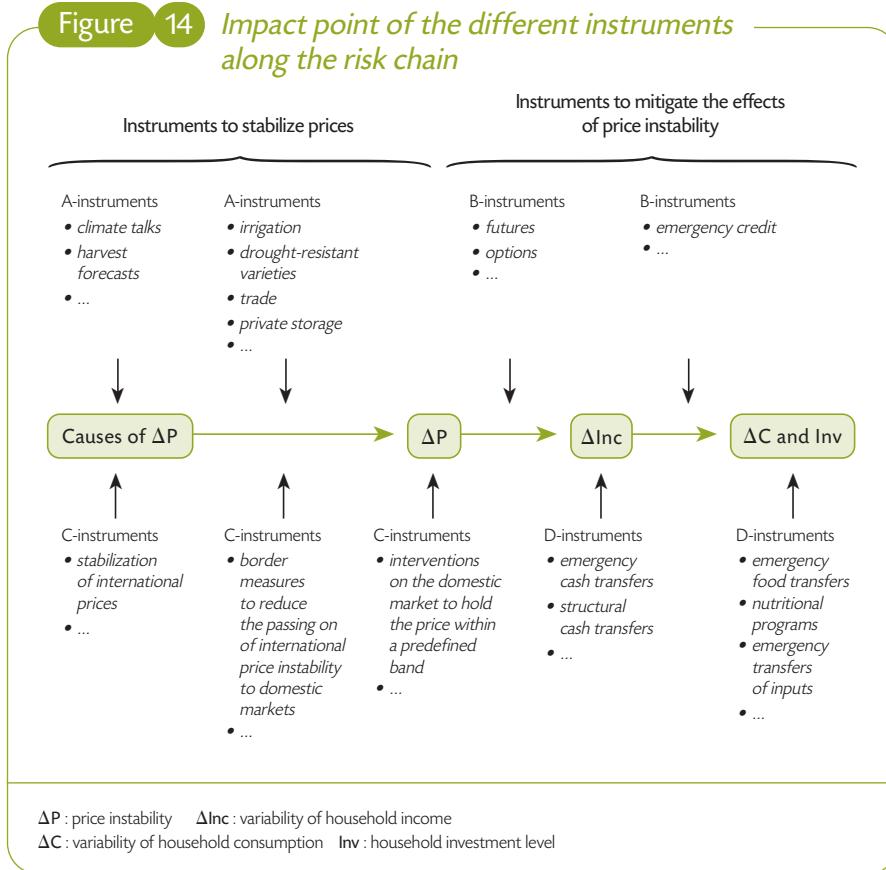
2. Selecting the right instruments for strategy implementation

C-instruments aim to stabilize prices through public interventions that regulate the quantity available on the domestic market (mainly through public stocks or import and export regulation).

D-instruments aim to mitigate the effects of price instability on the income of vulnerable households. These involve the transfer to these households of cash or goods, possibly with a matching contribution (generally work).

It should be noted here that the different instruments impact at different points along the risk chain (see figure 14).

Figure 14 *Impact point of the different instruments along the risk chain*



Source: author.

Some instruments act directly on the root causes of domestic price instability: natural hazards, instability in international prices, exchange rates or freight costs, or expectations instability. These instruments are few in number and are either A-instruments or C-instruments used mainly on an international scale (e.g. climate talks and international price stabilization schemes). Little action is possible against the root causes of instability on a national scale, except the provision of information to improve expectations (e.g. harvest forecasts).

Other instruments tackle the relationship between these causes and price instability. For instance, the *effect of climate hazards on prices* is dependent upon production sensitivity to these hazards and its capacity to respond to price incentives (price elasticity of production). By promoting the modernization of production, A-instruments reduce the effects of climate hazards on prices. The same may be said of the A-instruments used to modernize markets. By strengthening spatial arbitrage, they ensure that deficits in some areas are compensated by surpluses in others, and in this way diversify the risk arising from natural hazards. Similarly, if improvements in infrastructure and market institutions succeed in increasing private storage, then they will reduce the amplitude of price fluctuations. *Instability in international prices can be prevented from being passed on to domestic prices*, or its impact diminished, by recourse to variable tariffs or subsidies on imports or exports. Finally, a number of mechanisms can be used to reduce the *effect of expectation instability* on production, purchases and sales. For example, placing position limits on non-commercial operators is a means to prevent speculators operating on the futures markets from reacting excessively to the slightest change in price by rapidly buying or selling huge quantities of contracts, causing bubbles.

Direct action may also be taken against price instability using C-instruments. Here, the idea is to stabilize the quantity of product available on a country's domestic market in order to hold the price within a predefined band. This can be achieved by using public stocks or by regulating imports and exports.

Action may also be taken further downstream by preventing price instability from causing income instability. This is the role of price risk hedging tools such as futures and options.

Interventions can also be implemented to act directly on income instability. This is increasingly the role of D-instruments which are more and more based on transfers of cash or productive assets. Emergency cash transfers (triggered only in periods of crisis) aim to prevent the income and purchasing power of vulnerable households

from falling too low, and thus maintain their consumption and production capacity. Structural transfers (cash or productive assets) aim to bolster household resilience, i.e. their ability to maintain their income above the minimum level necessary to satisfy their basic needs in terms of consumption and input supplies.

Further downstream, credit-based B-instruments play an important role by mitigating the effect of income instability on consumption and investment.

Finally, when based on transfers in kind, D-instruments impact at the very end of the risk chain: they aim to help vulnerable households maintain their food consumption or production capacity when this is affected by a fall in their income or purchasing power. In this case, transfers directly target consumption (free distribution or moderately priced sales of food products or food vouchers; nutritional programs) or production (e.g. free distribution of seeds).

The line between the four instrument categories is sometimes rather fuzzy. For example, public stocks are C-instruments if intended to stabilize prices, but are D-instruments if used as emergency food reserves. Likewise, depending on how they are used, input subsidy programs may be considered as A-instruments, C-instruments or D-instruments. If these instruments are activated in a structural manner, aiming to bring about a structural transformation of agriculture, they are A-instruments. If they are activated only in response to a poor harvest, their aim is either to stabilize production and prices (C-instruments), or ensure that vulnerable households are able to maintain their production capacity (D-instruments). In this latter case, subsidies are targeted (see table 4).

Table 4 *Different types of input subsidy programs*

		Targeting?	
		Targeted	Not targeted
Activation	Structural	A-instrument <i>(aim: promote green revolutions)</i>	
	Conjunctural <i>(if poor production)</i>	D-instrument <i>(aim: maintain the production capacity of vulnerable households)</i>	C-instruments <i>(aim: stabilize production and prices)</i>

Source: author.

In this chapter, we will consider more in detail the manner in which these different instruments function, by successively considering A-, B-, C- and D-instruments.

For each category, we will begin by describing the rationale of the instruments, *i.e.* the manner in which they can contribute to managing price instability. We will then describe the *main instruments in each category and the characteristics that set them apart one from the other.*

Then, we *will discuss complementarity and substitutability relations between the instruments in the category, and with instruments in other categories.* There are **several types of complementarity.** Instruments are said to be complementary if they deal with distinct aspects of the price instability problem. For example because they concern different households (for instance, D-instruments apply to insolvent households, unlike A-instruments and B-instruments). Or because some instruments deal with rising prices (call options) whereas others deal with falling prices (put options). A second type of complementarity occurs when an instrument serves to tackle the perverse effects of another instrument. For example, governments may use B-instruments as a means to deal with the passing on of instability to State budgets (which is a perverse effect of C-instruments). Finally, a third case arises in situations of interdependency where one instrument needs other instruments to develop or function. For example, road improvements will only promote long-distance trade if commitments (payments and deliveries) can be enforced. There are also **several types of substitutability.** The simplest applies to instruments that do approximately the same thing (more or less well and at a more or less elevated cost). For example, imports may be slowed by recourse to tariffs or quotas. The problem here is to select the instrument that is most efficient (in a given context). Substitutability can also take more aggressive forms when the development of one particular instrument leads to the atrophy of another. This for example is the case if a (gratuitous) public instrument enters into competition with a (costly) private instrument. This is also the case if the use of a particular instrument increases the risk for users of other instruments. For example, if public interventions are poorly managed, producers and traders may abstain from building up stocks for fear that an intervention will drive prices down. This latter example demonstrates how complementarity and substitutability relations between instruments do not depend only on the nature of these instruments, but also on their governance.

We will then look at *the obstacles that hinder instrument development.* Many instruments that would in principle be most useful in fact never see the light of day. Others are offered to market actors, but these in fact seldom use them. We will present the different obstacles implicated and discuss possible means to overcome them.

The next step will then consist in assessing *instrument performance*. This will be tackled in three steps: instrument advantages (that which only instruments in this category are able to do or do better than others), their limitations (what they cannot do) and their perverse effects (namely on price instability or the development of other instruments).

Finally, we will conclude by considering the *attitude to adopt with regard to the instruments category concerned* (at a national-regional scale and the international scale). This will lead us to discuss the choices to be made in matters of allocating resources: should States and donors invest in instruments category x or y? Here we will have to consider the positive (synergetic) and negative interactions between different instrument categories. We will also consider the need to tackle all sources of instability and their consequences, if necessary by using several instrument categories. This last point will be considered in depth in the book's conclusion.

2.1. A-instruments: a potentially major stabilizing effect but very difficult to deploy in DCs

As we saw earlier, A-instruments play a crucial role when instability is of a natural origin, as is the case for many DCs, particularly in Africa. And some experts, since the failure of the optimal strategy (1.2.2.), have seen in them an alternative solution to B-instruments. We will begin by describing the rationale of A-instruments then the main types of A-instruments and the manner in which they can reduce price instability. We will discuss the complementarity and substitutability relations between A-instruments and between these instruments and those in other categories. We will then address the question of the difficult emergence of A-instruments, i.e. the obstacles that make production and market modernization so difficult. We will discuss possible solutions to overcome these obstacles. We will then outline the advantages, limitations and perverse effects of A-instruments and will conclude on the role that should be given to A-instruments in food price instability management schemes.

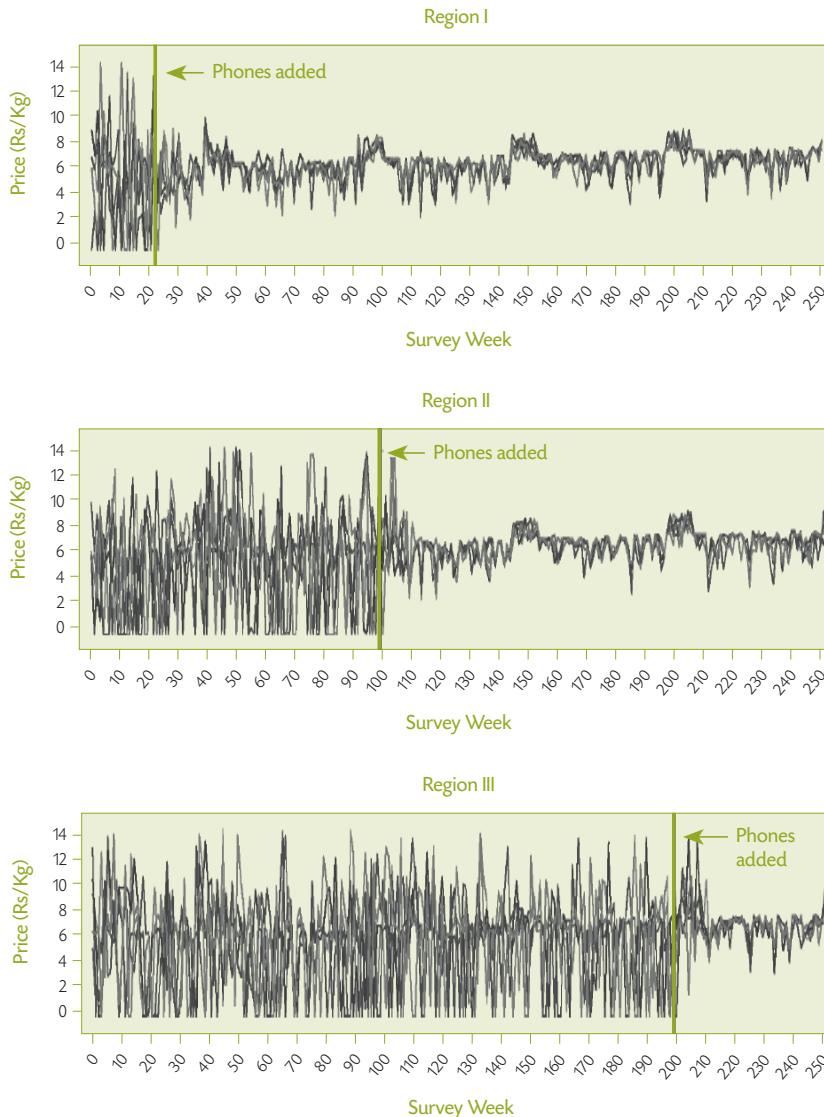
2.1.1. The rationale of A-instruments

The rationale of A-instruments is to render production, trade and storage more responsive to price movements for if these variables are able to adjust very rapidly, low magnitude price changes will be sufficient to restore equilibrium. The primary aim is therefore *to make economic actors more responsive to prices*. To do this, A-instruments aim to facilitate arbitrage in time (when to buy and sell), in space (where to buy and sell), between products (producer land allocation decisions, consumer purchasing decisions) and between (more or less intensive) production techniques. They also aim to *reduce the random component of production by making it less sensitive to the weather, to attacks by pests and to diseases*. This means modernizing both production and markets.

A-instruments have a very high stabilizing potential, as illustrated by the effect of introducing cell phones on the price of sardines in the Kerala state of southern India (Jensen 2007). Once the fishermen began to use their cell phones to decide on which market to go to in order to sell their fish, this had a spectacular effect on price instability (see figure 15). Before the cell phones were introduced, prices were very unstable and sometimes even fell to zero when the fishermen found it impossible to sell, for a lack of buyers. The introduction of cell phones resulted in prices moving in phase on the different markets. Prices were also far less unstable, and never fell to zero. It should nevertheless be underlined that *this spectacular effect was due to the very unfavorable initial situation*: the fishermen at sea had no means of knowing

what prices were being practiced on the various coastal markets. As a result, they chose at random the market on which to sell their fish. On top of this, given that the markets were of a very short duration (from 5 am to 8 am), the fishermen did not have the time to visit several markets, and since fish is a perishable good, they had to sell their fish on the market initially selected, whatever the price.

Figure 15 *Effect of introducing cell phones on the price instability of sardines in Kerala State (India)*



Source: Jensen (2007).

2.1.2. The different A-instruments

Production systems and markets may be modernized by developing infrastructures for production, transport, storage, processing and communication, but also by developing institutions, *i.e.* rules that shape production and trading activities (see table 5).

Table 5 *Types of A-instruments*

		Means	
		Develop infrastructures	Develop institutions
Goal	Modernize production and processing systems	A1. Research and extension services	A2. Land property rights
		A3. Production infrastructure (e.g. irrigation systems)	A4. Subsidies on inputs
		A5. Processing infrastructure (e.g. mills)	A6. Production credit
		A7. Transport infrastructure	A8. Weights and measures system
		A9. Communication infrastructure	A10. Grading systems
	Modernize markets	A11. Storage facilities	A12. Market information system
			A13. Storage credit
			A14. Warehouse receipt systems
			A15. Dispute settlement systems
			A16. Commodity exchanges

Source: author.

Most of these instruments are well known and do not call for any particular comment. It should simply be specified that grading systems serve to classify products into lots of homogeneous quality. This facilitates price comparisons and therefore arbitrages in time and space. Warehouse receipt systems are based on a very simple idea: the outsourcing of storage. A producer or trader entrusts his bags to a warehouse manager who in return gives him a receipt specifying the quantity deposited for each grade of

the product. This system has several advantages. It allows the products of different owners to be bulked (inside a given grade), which may sometimes lead to considerable savings on transport or storage costs (this is the main reason why this system was developed in Chicago in the 19th century, ultimately giving rise to history's first futures markets, see box 5). The warehouse receipt may also serve as collateral to obtain credit from a bank. Finally, the receipt may be traded, and this can be a way to reduce transaction costs. The dispute settlement system serves to enforce seller delivery commitments and buyer payment commitments. Such systems may for example take the form of arbitrators or clearing houses. These systems allow transactions to take place between market actors who do not know one another. Finally, commodity exchanges centralize offers and bids which in principle improves arbitrages, resource allocation and discovery of the equilibrium price.

2.1.3. Complementarity and substitutability relations between A-instruments

A-instruments are characterized by their very strong complementarity. Firstly, the services they offer to market actors are different. Secondly, the use made of these services by producers, processors, traders and consumers depends on their access to other services. More than a simple complementarity, here we are witnessing a veritable interdependence as we shall see by considering successively the case of production modernization and market modernization.

Modernizing production requires recourse to multiple A-instruments

Modernization aims to promote production that is both more intensive and less sensitive to natural hazards. These two aims may on occasion be contradictory, as for instance is the case with certain varieties that are more productive but less drought-resistant. We propose to qualify as "productive" all inputs that boost yields and as "stabilizers" all inputs that reduce production sensitivity to natural hazards. Many inputs fit into both categories.

In both cases, the aim is to stimulate producer investments, even if the inputs concerned are not the same. This first and foremost means developing the necessary *infrastructure*. This infrastructure involves research and extension services which aim to develop and disseminate varieties or technological packages that increase production or make it less sensitive to natural hazards. Agricultural research and extension can in part be provided by the private sector, but when this is deficient (as is often the case in DCs), the State must step in. Production infrastructure is obviously vital. The State must therefore take part in building infrastructure that may be considered to be a public good (as is the case for irrigation systems). Finally, the processing of

food products also plays a decisive role, particularly by rendering perishable goods suitable for storage. This in particular is the case for cassava that can only be stored once processed into flour. Processing may also have an effect on substitutability between products. For example, in West Africa, the processing of millet, sorghum, maize, yam or cassava may render these products more substitutable with rice (whose principal characteristic is that it is rapid to prepare). Consumer arbitrages therefore have a stabilizing effect insofar that when the price of rice rises, they switch to millet (and *vice versa*).

But infrastructure is not enough. Investment can only be stimulated in an enabling *institutional environment*. Firstly, the rights of producers on the investments they make need to be secured, which means that land rights must be secured (for instance through land titles). Moreover, many producers do not have the means to buy inputs (and even less so the means to invest in costly equipment). Also, they find it difficult to obtain credit. Instruments that facilitate production credit are therefore indispensable. Experience gained with successful green revolutions has shown that input subsidies are also necessary. These subsidies must be gradually reduced then phased out as the green revolution progresses, as a market for inputs develops, and as producer incomes rise.

Modernizing markets requires recourse to multiple A-instruments

Markets aim primarily to ensure product allocation in space (through trading) and time (through storage). Modernizing markets therefore means intensifying spatial and temporal arbitrage. Let us now look how the various A-instruments can contribute to this.

Strengthening spatial arbitrage

Short-distance trade is generally fairly easy to develop but is of little help in stabilizing prices which requires the connection of regions that are sufficiently far apart for natural hazards not to be correlated. But long-distance trade is far more difficult than local trade. Firstly, the cost of transferring products from one region to another may be prohibitive. Even if this is not the case, traders must be informed of the opportunities for arbitrage. Finally, when the buyer and seller do not know each other, a problem of enforcement arises: will the other stick to his commitment to deliver or pay?

Infrastructure and institutions need to be developed to overcome these problems. The first move here is to reduce transport costs by building roads, rural tracks and bridges, and combat the corruption that often takes the form of State employees charging "informal taxes". Fuel subsidies may also be envisaged. Producers and traders

must also be provided with information about large-scale arbitrage opportunities (differences in price and transport costs). This means developing communications infrastructure (particularly cell phone networks and, to a certain extent, the Internet). This may also involve the setting up of Market Information Systems (MIS) (see box 1).

Box 1 MIS, from the first generation to the second

Market Information Systems (MIS) collect, process and disseminate information on the state and dynamics of agricultural markets. They aim to improve both policies (by providing policy-makers with market information) and markets (by increasing their transparency for a more efficient and fair allocation of resources). In the 1980s and 90s (when agricultural markets were liberalized), an unprecedented number of MIS were created in DCs (Galtier and Egg, 2003). All these MIS had a fairly similar configuration, described in the inventory drawn up by FAO (Shepherd, 1997): *i*) each was centered on a country and a group of products (grain, cattle etc); *ii*) information was almost exclusively about prices; *iii*) this information was disseminated free of charge via radio, the press or boards at markets, and; *iv*) MIS were managed in a centralized manner by public bodies (ministries of agriculture, marketing boards), and were mainly financed by donors.

In the 2000s many of the MIS underwent major changes and new MIS emerged. These second generation MIS (or MIS2G) rely heavily on information and communication technologies (ICT) (Internet and cell phones) to transfer information between enumerators and MIS management units. This has reduced transfer timelines and the risk of data entry errors. These technologies are also used to disseminate information to market actors (producers, traders and consumers). Apart from shortening dissemination timelines, this provides the opportunity *i*) to diversify the information supply (users have access to a wide range of information and select the information they are interested in), *ii*) to obtain feedback on the information used (number of requests, number of downloads) and *iii*) to sell information (which has stimulated the development of private MIS).

MIS2Gs have also been the source of many organizational innovations (sometimes facilitated by ICT-based innovations) at various levels:

MIS institutional positioning. MIS1G generally used to be integrated within public bodies (ministries of agriculture, marketing boards). Today, many MIS2G are part of professional bodies (chamber of agriculture, chamber of commerce, value chain organizations, producer organizations) or are private companies.

MIS linkage with multi-stakeholder forums. Some MIS have become veritable suppliers of analyses for multi-stakeholder forums involved in the governance of markets and supply chains (see the cases of potato in Guinea, vegetables in Vietnam, rice in Madagascar and onion in Senegal).

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MIS decentralization. Here decentralization means not only that the information disseminated is selected specifically for each region in the country, but also that the information to be collected and disseminated is decided locally (the *Observatoire du Marché Agricole* [OMA] in Mali has in particular adopted this approach by developing local collection and dissemination units).

User-paid information. If cell phones are chosen as a means to disseminate information, then users can be charged. Some have even been tempted to develop private MIS that are supposed to be entirely self-financing through the sale of information. But in practice, these MIS are still mainly financed by donors.

Certain MIS are adopting commodity exchange models. The information provided by MIS1G focuses mainly or exclusively on average prices by product and locality. Some MIS2G provide data on individual "take it or leave it" prices (e.g. ZNFU4455 in Zambia) or offers and bids as for the Kenya Agricultural Commodity Exchange (KACE) in Kenya. This "individualization" of the information disseminated may be accompanied by mechanisms that bring buyers and sellers into contact (as is the case with the Market Resource Centers in Kenya), or even transaction facilitation services (brokering).

User support (training). Some MIS are betting on user training (SIEL in Madagascar, Esoko in Ghana), usually by working with non-governmental organizations (NGO).

Are these innovations able to increase the impact of MIS on market transparency and efficiency? The *interactivity* permitted by technical innovations (information disseminated by cell phones or the Internet) or by MIS decentralization will considerably increase the volume of information supplied by MIS and ensure that it better matches the needs of market actors (it is now possible to offer a wide range of information from which actors can "take their pick"). This means that more diversified information can be provided without overwhelming the user with data he does not need (increase in the number of products, markets, variables monitored). This also means that the information most often used can be tracked back (through the number of requests, the number of downloads). MIS can therefore constantly adjust their service to match the informational needs of market actors (producers, traders, processors, consumers, bankers, insurers, etc.). Private MIS (selling information) or MIS that are part of organizations controlled by market actors (producer organizations, chamber of agriculture, etc.) are also being urged to meet user needs. Information accessibility problems may nevertheless arise. The innovations implemented may increase inequalities by enhancing information asymmetries to the detriment *i*) of the poor (who do not have the means to purchase information or acquire cell phones), *ii*) of those who live in areas not covered by cell phone operator networks, or *iii*) of the less well educated (at a loss in the face of tool complexity: micro-exchanges, SMS, websites, etc.).

However, if prices or offers and bids are to be rendered comparable in different areas, then other market institutions are required, namely the harmonization and control of weights and measures and the implementation of grading systems. There is also a problem of trust. Offers and bids may not match actual stocks, and this underlines the importance of warehouse receipt systems that certify stocks both in terms of quantity and quality. But even this is not enough as there is always the danger that the trading partner will fail to meet his delivery or payment commitments. This problem may be resolved by setting up information systems on trader reliability or dispute settlement mechanisms. Agricultural commodity exchanges may also be set up, and these have two advantages. First, they boost competitiveness as each offer is brought into connection with each bid. Second, the problem of enforcing commitments no longer arises as each commodity exchange includes a clearing house. It is therefore clear that if spatial arbitrage is to be intensified, this usually requires a large number of A-instruments.

Connection to the international market constitutes a special case of spatial arbitrage (that poses specific problems). We have already seen, in the first chapter of this book, that strengthening the connection with the international market (to reduce the parity price band) is an effective means of reducing natural and endogenous instabilities. But certain goods are not the subject of international trade (they are said to be "non tradable"). This in particular is the case for much of the grain and many of the tubers produced in Africa: millet, sorghum, yam and cassava.^[73] This does not mean that there is no demand for these goods from other countries. It simply means that the way international trade functions requires the constitution of lots that are sufficiently large (enough to fill a container) and relatively homogeneous in quality. But, because of the manner in which markets are organized in producer countries, these conditions cannot always be met. However, specific action may be taken to render these goods more "tradable". The key here is to standardize product quality (in order to constitute homogeneous lots) and centralize stocks (so that large volumes may rapidly be mobilized). Warehouse receipt systems can play a major role in both these actions. Efforts may also be made to render non-tradable goods more substitutable with tradable goods. For example, in West Africa, were millet to be processed in such a manner that it is rendered simple and rapid to prepare, this would enhance its substitutability with rice. The parity price band for rice would in this case play a more substantial stabilizing role on millet prices.

[73] To a certain extent, this is also the case for maize, as the maize produced in Africa is little substitutable with the maize traded on international markets (because of differences in quality).

Strengthening temporal arbitrage

In the same manner as for arbitrage in space, if arbitrage in time is to be intensified, this requires a large number of A-instruments. Arbitrage in time is mainly reliant upon storage. For producers, it consists in storing and waiting for the right moment to sell. For traders, it consists in buying at the right time, then storing, and selling later in the hope of making a profit. For consumers, it consists in buying when prices are at their lowest. In all cases, temporal arbitrage is based on storage. The main difficulty facing storage is the risk of a drop in prices. This risk discourages storage and complicates access to credit (banks are reluctant to lend if the risk of non reimbursement is high). Moreover, many economic actors have insufficient access to credit because they have no collateral to offer banks or microfinance institutions. But without credit, many economic actors are unable to store.

A solution to this credit problem is therefore to use the stocks themselves as collateral. This is the idea on which the warehouse receipt system is based (see box 2) as the warehouse receipts serve as collateral when obtaining credit from the bank. If this is to work, then warehouse receipts must be credible, and means must be available to control and certify that the receipts issued by warehouses correspond to real stocks, in quantity and quality. This in turn requires a legal framework and a body of accredited certifiers. Also, banks will only be willing to lend if they have the means to assign a value to the stocks (which requires the existence of grades and MIS disseminating price information for the different grades). A bank's willingness to lend may be even further increased if it can readily sell the warehouse receipt should the borrower fail to meet loan repayments, and this is greatly facilitated by the existence of commodity exchanges.

The risk problem must also be tackled, as excessively unstable prices compromise access to credit and discourage storage (even when producers have access to credit). A solution can sometimes be found in price risk hedging instruments (see 2.2.). But, given that DC producers and traders find it difficult to access these B-instruments, it may be necessary to use a public mechanism to prevent prices from reaching excessively low values (see 2.3.).

Box 2 *Warehouse receipt systems: ZACA's experience in Zambia*

A warehouse receipt system (Zambia Agricultural Commodity Agency [ZACA]) was introduced into Zambia for grains under a project funded by the Common Fund for Commodity (CFC) and implemented by the Natural Resources Institute (NRI). Other donors subsequently provided co-funding, and continued to support when CFC and NRI ceased their involvement in 2004.

In 2001, the project helped key stakeholder groups (notably farmers, bankers and food processors) establish a non-government regulatory institution charged to certified companies to act as warehouse operators, take deposits from the public and issue transferable warehouse receipts against them. The first substantial deposits (6,000 tonnes of maize) occurred in the 2003/04 season, but its most successful year was 2004/05. The situation at that time was as follows: *i*) five warehouse operators were certified for a total capacity of 105,000 tonnes, *ii*) 65,900 tonnes of grain were deposited (including at least 3,764 tonnes by smallholder groups). ZACA was deriving its income from user fees paid by the warehouse operators, and was well on the path to breaking even.

There were no deposits in 2005 (a deficit year) and it is not very clear what happened in 2006, since by this time ZACA was getting into serious management difficulties. Available figures indicate nine warehouses were certified and 19,879 tonnes of maize were deposited, of which 12,300 tonnes by smallholders. In 2007 ZACA was wound up and some of its staff and assets were transferred to the new Zambia Agricultural Commodity Exchange (ZAMACE).

The demise of ZACA can be attributed to a combination of mismanagement, disabling policies (heavy government intervention crowding out private storage activity), lack of progress with supportive legislation, lack of consistent demand for the instrument, lack of commitment of some key stakeholder groups involved in ZACA, and poorly focused donor support (too heavily targeted at smallholder farmers in the short run).

Despite its demise, this initiative has demonstrated that such a system, properly structured and supported, is potentially viable, and moreover that smallholders can use it to trade with large processors and to obtain finance from leading international banks.

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These considerations on the means to develop spatial and temporal arbitrage show that the different A-instruments are both complementary (offering services that meet different needs) and highly interdependent (in the sense that each needs the others in order to function). This considerably complicates the development of A-instruments, as we shall see in section 2.1.5. For the moment, we will consider the complementarity and substitutability relations between A-instruments and the instruments in other categories.

2.1.4. Complementarity and substitutability relations between A-instruments and B-, C- and D-instruments

A-instruments alone are not enough to tackle the food price instability problem in DCs. Other instruments must be used to make up for their limitations, the most obvious of which concerns households that do not have the means to produce or purchase the food they need to survive. If they are to be helped, then A-instruments must be supplemented by D-instruments. The aim here is not only for D-instruments to meet insolvent demand while A-instruments deal with solvent demand, but also for D-instruments, if correctly used, to render insolvent demand solvent, thereby enabling vulnerable households to obtain supplies on the market, which in turn strengthens A-instruments. This in particular is the case when D-instruments take the form of transfers of cash or food vouchers.

A second limitation is the risk run by producers, processors and traders. Although A-instruments can often reduce this risk (by stabilizing prices or harvest volumes), they cannot do away with it altogether. They may even increase the risk, as occurs when a boom in long-distance trade destroys the natural insurance that covered producers by nullifying the negative correlation between harvest volume and price level (Newbery and Stiglitz, 1984). If the risk run by market actors is maintained at an elevated level, or is increased, this has a negative effect on investments in production, processing and storage infrastructures, *i.e.* on the development of A-instruments. Only B-instruments (that are often ill-suited to the needs of DC market actors) or C-instruments can break this vicious circle.

But other category instruments may sometimes go too far. Instead of merely providing the additional assistance required to ensure that A-instruments function correctly, they may crowd them out. This in particular is the case for C-instruments and D-instruments when poorly managed. The fear that a public intervention will drive prices down discourages private storage. But this crowding out of A-instruments by C-instruments or D-instruments can be avoided if these instruments are correctly governed (1.5.3).

Likewise, if A-instruments are supported by public subsidies, they may develop to the detriment of C-instruments or D-instruments. Important arbitrages must therefore be made concerning the use of public funds.

2.1.5. *The difficult emergence of A-instruments*

Efforts to modernize production and markets in DCs have met with little success (particularly in Africa and Latin America), and many attempts may be said to have failed. We will first consider the main obstacles blocking the growth of A-instruments, before presenting what can be done to facilitate their development.

Main obstacles to the emergence of A-instruments

Our review of the literature identified the following obstacles:

1. *The scale of the implementation of A-instruments is often inadequate.* Spatial arbitrage will only reduce natural instability if it connects production areas that are far apart and therefore subject to non correlated natural hazards. Instruments developed on a regional rather than a national scale should therefore be preferred (e.g. across West Africa). In certain cases this will also reduce instrument costs through economies of scale.
2. *The public goods that A-instruments need in order to function are often lacking.* For example, warehouse receipt systems require a legal framework and a body of accredited certifiers, and these are often lacking.
3. *A market actor's incentive to use an instrument often depends on the extent to which this instrument is used by other actors.* For instance, a grading system used to classify different qualities of grain is only meaningful if it is used by a sufficient proportion of buyers and sellers. If use does not reach this critical threshold, the instrument will be dropped.
4. *A-instruments are highly interdependent, which generates circularity problems.* If instrument x requires instrument y in order to develop, but y requires x, it is highly likely that neither x nor y will develop without external assistance. These circularities prevent the development of A-instruments. This is clearly illustrated by the example of warehouse receipt systems (see box 3). The problem is even more acute for the most sophisticated instruments as they need others to already be in place. This in particular is the case for agricultural commodity exchanges and doubtless explains why their development is still very limited (particularly in sub-Saharan Africa, see box 4). These exchanges need grading systems and warehouse receipt systems, but these are often lacking in developing countries.

Box

3

The difficult emergence of market instruments due to inter-instrument circularity problems: the case of warehouse receipt systems

If they are to function properly, warehouse receipt systems need other market institutions. In particular, their development is greatly stimulated if warehouse receipts can be used as collateral to obtain bank credit. But banks are only willing to lend if they have the means to give stocks a value (which requires the existence of grading systems and MIS disseminating price information for the different grades). Moreover, their willingness to lend may be greatly increased if they can readily sell the warehouse receipt should the borrower fail to meet loan repayments, and this is greatly facilitated by the existence of commodity exchanges. But warehouse receipt systems are themselves the main incentive for developing grading systems. And are often a prerequisite for the emergence of commodity exchanges. These market institutions therefore do not yet exist when attempts are made to set up warehouse receipt systems, and this handicaps their development.

F. Galtier

Box

4

African commodity exchanges still show little development for grains

Africa does not possess many grain exchanges. If we exclude the Abuja Securities & Commodity Exchange and the grain micro-exchanges promoted by Afrique Verte NGO in West Africa, these commodity exchanges are almost all located in the countries of eastern and southern Africa.

Other than the emblematic case of the South Africa Futures Exchange (SAFEX) (see box 8), the main African grain exchange was the Zimbabwe Agricultural Commodity Exchange [ZIMACE]. This was opened in 1994 but was subsequently ordered to close by the government. It may nevertheless be considered a 'success story' given the large volumes it traded: in 2001, ZIMACE negotiated contracts worth approximately 500 million USD. Its members-shareholders were mainly producer organizations, millers, major grain traders and the state-owned Grain Marketing Board (GMB). It was financed by member subscription fees and commissions on transactions. Maize, wheat and soybean were the main commodities traded. Members appointed brokers who participated in daily trading sessions, using the system of open outcry. Trading contracts specify quantity of the commodity, quality or grade, price and terms of payment, type of

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transport for delivery, place and date of delivery, packaging, time when property title passes to the buyer and an arbitration clause, providing for rapid and low-cost resolution of disputes. As ZIMACE developed, it found it needed to register warehouses where commodities could be delivered against contracts (it started with warehouses belonging to the parastatal Grain Marketing Board). ZIMACE appointed inspection companies, notably ITS Socotec, to inspect warehouses and commodities, and issued standard ZIMACE warehouse receipts as a basis for trading on the exchange.

The other exchanges have so far developed very limited volumes of business in food crops, and remain overwhelmingly dependent on donor and government support. Some have developed other lines of business.

The story behind the Kenya Agricultural Commodity Exchange (KACE) is rather unusual. The system began as a typical exchange in the form of a trading floor based in Nairobi, before being decentralized. Market Resource Centers (MRCs) were set up in different parts of the country. They disseminate information about prices, offers and bids (by means of notice boards), and also play the role of micro-exchanges serving to match offers and bids (even if the volumes traded are extremely small). Today KACE functions mainly as a market information system (MIS): it collects information about prices and disseminates this through different channels (national and local radios, MRCs, SMS).

The Ugandan Commodity Exchange (UCE) hardly operates as a trading floor, but is Government's agent in licensing warehouses under the Warehouse Receipts System Act of 2006. This activity may eventually render UCE's exchange function viable, since the leading constraint on the development of this exchange (and other incipient exchanges) has been the lack of a "delivery mechanism", *i.e.* warehouses where stocks offered can be graded and kept secure until required for delivery.

The Zambia Agricultural Commodity Exchange (ZAMACE) has developed from the now-defunct warehouse certification agency (ZACA) (see box 2). Conceptually speaking, it drew its inspiration from the ZIMACE model and the Agricultural Commodities Exchange (ACE) established in neighboring Malawi. The latter provided technical assistance and software. Leading Zambian-based trading companies make up the initial membership, but it subsequently opened up to new players, notably brokers without trading interest in the commodities handled. A USAID project is supporting the project, as is WFP-Zambia, which has opted to do all its local procurement through ZAMACE. Between October 2007 (when operations began) and October 2010, ZAMACE traded more than 62,000 tonnes of commodities (including more than 54,000 tonnes of grain) worth more than 20 million USD.^[74] It also "registered"

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[74] Readers may update these figures at:

http://www.zamace.com/info/index.php?option=com_content&Itemid=23

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120,000 tonnes of other transactions by its members. ZAMACE has a number of factors working in its favour: large-scale players on the farming and processing side and the commitment of a large public sector buyer (WFP-Zambia). Starting in 2010, ZAMACE trained and certified a number of warehouse keepers who would be linked to the exchange and take deposits of maize from smallholder farmers. However it turned out that Government procurement at very high prices completely crowded out the initiative and there were practically no deposits. Notwithstanding significant progress, ZAMACE has a long way to go before it becomes financially sustainable without external support.

The Ethiopian Commodity Exchange (ECX) was launched in 2007, and is now by far the largest operation outside of the Republic of South Africa (see box 8). It is owned by the Government of Ethiopia, which funded the initial capitalisation of about US\$20 million, and substantial donor contributions. It also has a paid-up membership, exchange actors trading on their own account and for the account of others. The exchange is run by a board consisting of 11 members, of whom six including the chairperson are Government-appointed, and five elected by members. The original objective was to trade in food grains, but in practice the facility was little used, though WFP has made some use of it for procurement. The situation changed radically in late 2008, when Government mandated all coffee, the leading export crop, to be traded through ECX, following up with sesame and pea beans, the key ingredient used in making canned "baked beans". The volume traded has grown very fast reaching, 509 thousand tonnes in 2010/11. ECX has 17 warehouse locations all of which it runs directly itself. However standard ECX contracts are quoted as "arrived Addis Ababa" and a locational differential (discount or premium) is applied, based on transport tariffs from Addis to the actual delivery location. ECX regularly updates the transport differentials and makes this information known in advance of a trading session. Clearing and settlement are handled by partner settlement banks and the contracts are for immediate delivery of the physical commodities.

Since 1990, the NGO Afrique Verte has been active in Mali, Burkina Faso and Niger, helping farmer organizations (FO) sell grain, and buy grain in deficit areas. Its key feature is to set up "micro-exchanges", which are annual events that bring together different players (FOs and traders) in deficit areas with those in surplus areas. In 2005, Afrique Verte's shift to autonomy led to the creation of three associations in Mali (AMASSA), Burkina Faso (APROSSA) and Niger (AcSSA) that remained in possession of all its knowledge and expertise in the Sahel. For Mali alone, more than 77,429 tonnes of grain (millet, sorghum, maize, processed products) were sold between 2001 and 2008 through Afrique Verte's exchanges (Haïdara, 2010).

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Apart from these individual country initiatives, there have been various attempts to establish a regional exchange, including attempts by the Malawian-based Agricultural Commodity Exchange (ACE), the Pan African Commodity Derivatives Exchange (PACDEX) and Bourse Africa. In West Africa, the EU supported ECOWAS to fund a feasibility study for a regional exchange. Apart from some trading in Malawi, we have no evidence that these initiatives have so far produced results. The difficulties in establishing a national exchange are compounded in a regional initiative which has to cope with a variety of laws, regulations, currencies and grading systems, and as we have noted elsewhere, food commodities are susceptible to bans on trade between neighbouring countries. Bourse Africa, owned by the MCX Group of Mumbai India (now the World's leading exchange in terms of numbers of contracts traded) appears better placed than other players to establish a regional exchange. It is currently seeking to establish a 'hub-and-spokes' system with existing exchanges.

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5. *Public interventions may discourage private investment and storage.* This is because public interventions (based on C-instruments but also to a certain extent on D-instruments) may cause prices to fall sharply and thus lead to considerable losses for producers or traders who have stored or made investments. If private actors expect such public interventions to take place, they may well no longer invest or store. However, this crowding out effect occurs mainly when public interventions are unpredictable (Chapoto and Jayne, 2009; Tschirley and Jayne, 2010).
6. *Vicious circle between price instability and the development of A-instruments.* Given that producers and traders are risk-averse, price instability may discourage investment in and even the use of A-instruments (which often involve storage). But the under-development of A-instruments itself maintains high levels of price instability. This vicious circle can only be broken by using C-instruments to stabilize prices.
7. *Vicious circle between price instability and market size.* When prices are unstable, households develop self-consumption strategies that narrow markets. This in turn keeps prices unstable as narrow markets are more sensitive to natural instability. In addition, producers and traders are reluctant to invest if the market is too narrow.

8. *Paucity of benefits from market modernization (at the individual level)*. Although A-instruments generate benefits for market actors, they come at a cost. Producers and traders must therefore consider the cost and the benefits that stem from using A-instruments. It is this cost-benefit ratio that marks the limit of the market modernization process once obstacles 1 to 7 have been removed. In the past, market modernization was possible in Chicago because it resulted in a huge saving on costs (see box 5). Likewise, the special configuration of the maize market in Zambia gave this country's MIS a potentially greater usefulness than that of equivalent MIS in other countries (see box 6). It should also be noted that even if all these obstacles are removed, the development of A-instruments may remain suboptimal because of positive externalities. For instance, if an MIS is used by a sufficient number of actors, markets function better and this ultimately benefits those who are not direct users of MIS information. The collective advantage of an MIS being used therefore exceeds the individual advantage of the producers, traders and consumers using the MIS.

Box 5 A success story: Chicago

Cronon (1991) showed how a succession of profitable innovations in Chicago in the middle of the 19th century allowed warehouse receipt systems to emerge followed by the first futures markets in history. At that time, most grain was shipped by river boat. Grain was shipped and stored in bags, generating high stevedoring costs. Change was kick-started by the *development of railroads* that reached Chicago in 1848. Trains significantly reduced the cost of grain transport. This allowed new production areas to be developed and resulted in Chicago overshadowing Saint-Louis and New Orleans, becoming the main platform for grain trade in the USA by 1854.

This innovation led to another. New technology had been invented a few years earlier for grain storage: *elevators*. These in fact are "mechanized" warehouses: grain is elevated to the top of the tower then directed into different compartments where it is stored. These steam-driven elevators at the time were not in widespread use, mainly because of technical problems (changes in the level of the Mississippi river meant that warehouses had to be located some distance from its banks). It was the development of rail transport that led to their massive deployment, namely in Chicago as they constituted an ideal solution to the problem of railroad congestion induced by the manual unloading of trains. But the use of elevators led to a new problem: grain needed to be stored in bulk rather than in bags. This meant that warehouse space was lost as many of the compartments used to store the grain belonging to different owners were rarely full. This problem could only be resolved by mixing grain owned by different people, which was difficult given the great range of different qualities.

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This led to a third innovation: *the setting up of a grading system*. This system was brought into use in 1856 by the Chicago Board of Trade (founded in March 1848 to promote grain trade, lobby the government and arbitrate in disputes between members). This grading system (that was too subjective and subject to fraud) functioned poorly at the beginning: it led to a sharp decline in the quality and reputation of Chicago wheat (following the well known adverse selection mechanism discovered by Akerlof in 1970). This problem led to the development in 1860 of a body of certifiers employed by the Chicago Board of Trade, but this was undermined by problems of corruption. The problem was solved only in the next decade with the development of a legal framework (Article 13 of the Constitution of the State of Illinois in 1870 and the Warehouse Act in 1871) establishing (among other things) State control over grain inspections.

The standardization of grain quality paved the way for another major innovation: *the trading of warehouse receipts*. Each farmer or trader depositing grain in an elevator was given a receipt specifying the quality and quantity of grain held. As qualities were standardized, so were the warehouse receipts. It was therefore possible to buy grain even without seeing it, simply by acquiring warehouse receipts corresponding to specific grades. Stocks of wheat or maize could thus be the subject of dozens of successive transactions without moving an inch.

The arrival of the first telegraph wires in Chicago in 1848 gave rise to another innovation: *the development of forward contracts*. In this type of contract, two parties agree to buy or sell an asset several weeks or months hence at a price agreed today. This is a means they employ to hedge the price risk. This type of contract had been around for a long time but its use was greatly boosted by the telegraph that allowed information on prices practiced at other locations to be disseminated in real time.

The flourishing market in warehouse receipts allowed actors to sell forward contracts even if not in possession of any stocks (given that on the contract delivery date they could buy warehouse receipts to fulfill their commitments). These speculators seek to make a profit (if the price falls, they buy warehouse receipts at a lower price than they sell them for). The Chicago Board of Trade followed this trend from 1865 by *regulating forward contracts, namely by standardizing delivery dates*. The first futures markets in history were born.

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Box

6 *How the ZNFU4455 MIS managed to reduce trading costs for certain maize producers in Zambia*

The organization of the maize market in Zambia is somewhat unusual. Whereas grain markets almost everywhere in Africa are driven by wholesalers who vary prices according to the time and the customer, the dominant actors in Zambia are major processors (millers, brewers, cattle feed producers). And they buy at prices that are decided every Monday then remain stable for the rest of the week. This means it is possible to collect and disseminate information on the price practiced by each of these processors (of which there are about 230 in all). The ZNFU 4455 MIS, which was launched in October 2006 and is managed by the very powerful Zambia National Farmers' Union (ZNFU), does exactly this. Actors who make the request are sent the 10 best prices (with the names and contact details of the relevant processors) by SMS. Some empirical evidences suggests that ZNFU 4455 has allowed certain producers to sell directly to processors. Traditionally, producers sold to small traders located in the production areas. Thanks to ZNFU 4455 it has now become profitable for certain producers to bulk their products together then travel to Lusaka or other large cities to sell them directly to those processors who pay higher prices. However, as the ZNFU 4455 MIS has only a small number of users, its impact is rather limited.

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How can the development of A-instruments be facilitated

The key is to proceed step by step. For example, no attempts should be made to set up commodity exchanges until warehouse receipt systems are sufficiently developed. The general idea is to attempt to remove obstacles 1 to 7 described in the previous section and determine where the market modernization process is brought to a halt. In theory, this point is reached once the cost of using the instruments exceeds their benefits for market actors.^[75] Therefore, there is no certainty that the process will ultimately lead to the emergence of sophisticated instruments such as commodity exchanges. Certain A-instruments (such as MIS and warehouse receipt systems) will doubtless be used by a proportion of producers and traders, with this proportion varying with country and context.

[75] It can be a little more complicated if A-instruments generate positive externalities. In this case, the spontaneous development of these instruments will be sub-optimal. This justifies public subsidies for A-instruments.

If the obstacles in the path of A-instruments are to be removed, then States (backed by donors) must provide the necessary support. This support first and foremost takes the form of the public goods necessary for A-instruments to function. For example, warehouse receipt systems will only develop if *i*) a legal framework is set up, and *ii*) a body of accredited certifiers are able to check that warehouse receipts match actual stocks (in quantity and quality). Public support may also be technical. Finally, subsidies are doubtless necessary for a certain period such that the instruments may reach a sufficient volume of usage to attract economic actors (the incentive to use an instrument often depends on the extent to which it is used by other actors).^[76] Circularity problems between instruments can be overcome by adopting an integrated approach, *i.e.* by supporting the development of different A-instruments simultaneously (e.g. grading systems, MIS and warehouse receipt systems). Finally, A-instruments should be developed if possible at a regional scale as this stimulates trade on a larger scale and thus has a greater stabilizing effect on prices. The Eastern Africa Grain Council has developed such a regional, integrated approach, namely for white maize (see box 7).

Box 7 EAGC's experience on market modernization: a regional and comprehensive approach

The Eastern Africa Grain Council (EAGC)

EAGC was established in 2006 at the request, and through the efforts of, key stakeholders in all three sections of the grain value chain; producers, traders and processors with the aim that it would prepare, disseminate and promote the exchange of information on matters affecting the regional grain industry and also be the representative body on behalf of the membership to regional authorities. The concept and formation of EAGC – although predominately private sector owned – fits well with the African Union (AU) and New Partnership for Africa Development (NEPAD)'s Comprehensive Africa Agriculture Development Programme (CAADP) framework which recognizes agriculture as central for the alleviation of poverty and hunger and hence for reaching the Millennium Development Goals (MDGs).

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[76] Another more radical option consists in making the use of a given instrument mandatory. This was the option chosen for export products by different African commodity exchanges, for instance the Ethiopian Commodity Exchange (ECX). This solves the problem stemming from the fact that the usefulness of an instrument depends on a certain critical mass of users being reached. But this approach is difficult to apply to internal trade (which would mean controlling transactions within the country). Above all, it creates the risk of constraining economic actors to use an instrument that does not fit their needs.

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The mandate of EAGC is to develop, promote, and influence structured grain trading system in the eastern Africa region with defined rules and regulations. Its core function is to improve the policy and trading environment in the Eastern Africa regional grain trade, strengthen market linkages and reduce the constraints along the grain value chain. To achieve this, the Council works closely and in partnership with governments in the region. EAGC continues to push for a market-led trading place away from the earlier position influenced by governments through grain marketing boards. The current focus is on nine countries in the larger Eastern Africa Region-Kenya, Tanzania, Uganda, Rwanda, Burundi, Zambia, Malawi and Ethiopia and South Sudan.

In order to get off its feet and deliver its mandate, EAGC has benefitted immensely from key donors including SIDA, USAID, Financial Sector Deepening and AGRA with the vision to become self sustaining.

EAGC's approach of market modernization is regional and comprehensive. It encompasses market institutions, policy environment and stakeholders' capacity building.

1. Establishing and strengthening grain market institutions

Warehouse Receipts System (WRS). In 2007, EAGC successfully piloted a warehouse receipts system (WRS) and partnered with financial institutions whose support is crucial to the implementation of the system. Subsequently though, poor seasons due to changing climatic conditions have been a challenge to the replication of the earlier success. However the Kenya government's interest in the system's potential as a foundation for a commodity exchange has since led to the formation of a private sector led process that now seeks to anchor the same in legislation and EAGC is spearheading current multi-sectoral public private sector efforts. The potential benefits include reduced post-harvest losses (currently estimated at over 30% in Kenya); better storage; reduced transaction costs; increased market efficiency; market price discovery mechanisms; market risk management; increased liquidity in commodity markets; improving product consolidation and quality among others. There has been consensus from EAGC members (mainly from private sector) and the public sector to develop an integrated system where WRS and Commodity Exchange can be regulated by a single unit. Over the past three years, the Council has certified three warehouses with a capacity of over 50,000 (fifty thousand metric tons). More capacity is expected to come under use as the system gains acceptability among small scale producers.

Towards an EAC integrated process, EAGC is currently collaborating with the Tanzania Warehousing and Licensing Board (TWLB) and the Uganda Commodity Exchange (UCE). These are government supported systems in Tanzania and Uganda respectively and EAGC's partnership is to introduce private sector influence that is hoped to attract more confidence especially from financial partners. EAGC through the EAC

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Secretariat is seeking to facilitate a regional coordinating mechanism on Warehousing Receipting that is hoped will eventually lead to a regional Commodity Exchange. Already a GIS integrated network of Warehouses has been established as part of the preliminary steps. Ongoing efforts seek to link this to the price and other real-time market intelligence and applications that will feed the system on current stock levels held by participating farmers.

Regional Agricultural Trade Intelligence Network (RATIN). The scope covers access to the market information regarding sources and outlets of grain, prevailing market prices, trade flows and other dynamics, the lack of which had been identified as contributing to the sub-optimal performance of the sector. RATIN is an up to date portal disseminating market price and other data on a daily basis from across forty wholesale markets in the EAC-Rwanda, Uganda, Tanzania and Kenya and covering information on the region's main staples (maize, beans, sorghum, rice, wheat and millet). Price information and other market intelligence through the website (www.ratin.net) are open to members and other users. Information is also disseminated through an SMS facility, quarterly newsletters and weekly market reports. 2010 usage stands at twenty five thousand.

Electronic grain trading platform. The Council has also developed an electronic trading platform www.egtAfrica.com that seeks to link sellers of agricultural produce with potential buyers. Sellers communicate with EAGC officers about available stocks, location and asking prices and this information is then posted to the platform for bids by potential buyers. The Council is integrating this platform into the overall market information system to promote structured trading.

The biennial African Grain summit continues to be an important melting pot and a crucial networking forum for traders, producers and policy makers that always generates critical discourse towards improving agricultural commodity trade.

Annual Agribusiness Fairs in EAC countries (Kenya, Uganda Tanzania).

Development and dissemination of regional (EAC & COMESA) Staple Foods Standards. EAGC has partnered with regional blocs to disseminate in the COMESA region staple food standards developed by the EAC. So far a ToT has been carried out and in which eighty trainers from the COMESA region participated. Currently, twenty three more food commodity standards are in the validation process supported by EAGC across the EAC region before another round of ToT is done.

Arbitration. In 2009, EAGC facilitated the training of nine internationally accredited arbitrators as an alternative mechanism of trade dispute resolution.

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2. Contributing to promote an enabling policy environment

The Council contributes to the promotion of an enabling policy environment through collaboration with regional governments and Regional Economic Communities particularly COMESA and EAC to tackle key barriers limiting regional commodity trade. The development process for a Regional Food Balance Sheet currently being pursued by the Council is part of the evidence-based advocacy at both government and regional economic bloc levels by the Council towards food security through trade. The Council has also been on the forefront of identifying tariffs and other non tariff barriers that stifle trade and lobbied for their removal. Progress has been made with regard to reduction of road blocks that were a major conduit for corruption. The reduction of import duty on wheat from thirty five to ten per cent in line with the EAC Common Market Protocol is part of the work done by EAGC and its partners.

3. Contributing to increase the capacity of grain market stakeholders

Capacity building for different stakeholders along the value chain (traders and farmer organizations, exporters, financial institutions and distributors). Training encompasses regionally applicable rules of grain trade (standard grain contracts, rules and the process of arbitration). In the past two years, over seven thousand participants have undergone training through the Council's facilitation in the EAC and other countries including Malawi and Zambia.

Perspectives

Alongside the ongoing public private partnership process on the warehousing receipting regulatory framework, the Council is in the process of harnessing its market information systems in collaboration with a local financial institution to integrate warehouses and develop an over the counter electronic trading platform for Warehousing Receipting that will incorporate consolidation of warehouse receipts on sale, matching of offers to sell and bids to buy, settlement through mobile money transfer to small-scale holders. It is envisaged this will reduce transaction costs by up to twenty per cent and thus increase farmers' incomes.

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Efforts must also be made to render public interventions predictable, for the fear that public interventions will drive prices down has the effect of discouraging private actor investment in A-instruments.^[77] These rules mean that the State may intervene only when prices move outside a previously defined band. If the ceiling price is set sufficiently high it will reassure private actors for they know the State will not intervene while the price has not reached this level. Also, the floor price protects producers and traders from a sharp fall in price. It is possible, and often desirable, to associate private actors in the process used to set and update the price band (or more generally in policy-making). This can be achieved through multi-stakeholder platforms (see the example of Madagascar, box 16). Predictable public interventions in this case can stimulate the investments necessary to modernize production and markets. They may also increase market size insofar that when prices are less unstable, households are less tempted to fall back on self-consumption strategies.

State support is required to stimulate the development of A-instruments. This support must be gradually reduced and must disappear altogether (with subsidies halted) once the instruments have reached a critical size. The system then settles into an equilibrium: the market modernization process stops when the additional benefit induced by a further development of A-instruments no longer exceeds the additional cost it generates. Given that producers and traders in Sub-Saharan Africa find it difficult to access credit, warehouse receipt systems are likely to show strong growth on condition that obstacles are removed. The development of exchanges is less likely.

It is also possible that the process of market development will lead to instruments being adapted to match local contexts. A particularly interesting case of this concerns the development of grain micro-exchanges in West Africa (by the NGO Afrique Verte) and in Kenya ("market resources centers" developed by the Kenya Agricultural Commodity Exchange).

2.1.6. *The advantages, limitations and perverse effects of A-instruments*

With the failure of the optimal strategy (based on B- and D-instruments), some experts saw production and market modernization as an alternative solution to the problem of food price instability (Byerlee *et al.*, 2005 Chapoto and Jayne, 2009; Tscharley and Jayne, 2010). This meant placing A-instruments center stage in the food price instability

[77] It should be recalled that non-intervention is not a solution that will reassure producers and traders, or stimulate their investments. Indeed, a State's commitment not to intervene lacks credibility: everyone knows that pressure from the street will force the State to intervene if the price rise is too great.

management scheme. Is this solution relevant? Are A-instruments enough in situations of natural instability? Can A-instruments tackle the problem in situations of imported and endogenous instability?

The advantages of A-instruments

It is in situations of *natural instability* that A-instruments come into their own. We can even say that they are indispensable for countering this type of instability since only production and market modernization can sustainably reduce food price instability stemming from natural hazards. For example, trade between regions that are sufficiently far apart for natural hazards not to be correlated will diversify risks (regions that are far apart are unlikely to experience drought or attacks by locusts at the same time).

A-instruments play a far more minor role in situations of *imported instability*. Their only (small) effect is that private stocks may delay and slightly mitigate the passing on of international price instability to domestic prices (as occurred in 2008).

Some A-instruments may have a beneficial effect on *endogenous instability*. MIS may in principle reduce expectation instability on condition that they are forecast-orientated (which is rarely the case). Warehouse receipt systems increase stock visibility which may slightly discourage speculative bubbles and panics. But it is above all against the cobweb effect that A-instruments have a role to play. The cobweb effect may in theory be lessened by multiannual private storage (for here the price is no longer dependent upon the current year's production). It may be restricted by international trade (for the parity price band bounds price fluctuations, see figure 7). Finally, production credit may sometimes reduce cobweb effects by preventing excessive drops in production in response to falling prices (credit allows producers to maintain their production capacity).

The limitations of A-instruments

The main limitation of A-instruments is simply that they are very difficult to develop. For example, in Africa, the development of long-distance trade would require both major investment to improve roads and substantial action to reduce informal taxation by State employees. Other factors may also limit the stabilizing effect of A-instruments, namely a lack of competition on certain markets (dominated by a few major traders).

Also, even successfully developed A-instruments may have only limited effects on price instability. Prices may be very unstable even on highly efficient and competitive markets. Even in situations of *natural instability*, A-instruments are not enough: price surges may occur even in perfect markets with risk-neutral storers (Williams and Wright, 1991).

Such surges for grains may have very harmful consequences for consumers in DCs. The problem becomes even more acute if we introduce the fact that very little private multiannual storage is actually practiced because producers and traders are risk-averse. Therefore, private storage can only effectively tackle the problem of seasonal price instability (Galtier *et al*, 2010). A-instruments are mainly ineffective in the face of *imported instability* even though private stocks may slightly lessen the passing on of international instability. A-instruments are also of little use in the face of *endogenous instability*. Although they may help to a certain degree in reducing the cobweb effect, they are relatively ineffective in the face of speculative bubbles and panics (in this case, we cannot count on private storage as speculative bubbles and panics are precisely due to stock hoarding practices).

The perverse effects of A-instruments

A-instruments may generate unwanted effects. In situations of *natural instability* these effects are fairly minor, being mainly limited to the fact that the development of long-distance trade reduces producer "natural insurance" (the negative correlation between price and production) and may therefore accentuate their income instability (Newbery and Stiglitz, 1984). This may discourage agricultural investment.^[78]

More substantial perverse effects are seen in situations of *imported instability* when the development of spatial arbitrage and market integration can mean that variations in international prices are more readily passed on to the domestic market. In particular, all the measures taken with the intention of rendering goods more tradable (or substitutable with tradable goods) enhance a country's exposure to imported instability.

But it is above all in situations of *endogenous instability* that A-instruments may have a harmful effect on price instability. If A-instruments function too well, this may generate endogenous instability. To understand why, we have to consider the general mechanism of endogenous instability: expectation instability leads to unstable farming or trading behaviors that in turn generate price instability and feed the instability of expectations. It is this mechanism that comes into play in the cobweb, in speculative bubbles and in panics (1.3.2). As A-instruments make behaviors more sensitive to price movements, they can increase endogenous instability. If price elasticity of production increases, the cobweb effect may also increase. And as for market modernization, it tends to increase the probability of speculative bubbles and panics. In addition, it has an ambiguous

[78] But the magnitude of this effect is not particularly great, for as we have seen, natural insurance in practice only plays a minor role (1.2.3).

effect on the cobweb. Storage tends to mitigate the cobweb but trade has more complex effects. Firstly, market modernization may result in cobweb dynamics on sales behaviors (see footnote 8). Secondly, international trade may bound national cobweb dynamics as the price is constrained to remain within a band defined by the parity price. But it may thus synchronize these dynamics (Boussard *et al*, 2006).

This does not mean that we should cease using A-instruments to modernize production and markets. Quite the contrary, as this modernization is necessary to reduce natural instability. But this does mean that the perverse effects induced by production and market “fluidity” must be countered using other instruments. In particular, behavioral sensitivity to price movements must be reduced in certain very precise situations. For example, it may prove judicious to make futures markets a little less fluid by taxing the transactions made on these markets (Tobin type tax) or by placing position limits on non-commercial operators.

2.1.7. What can we achieve with A-instruments?

A-instruments are an indispensable part of any price instability management scheme. Although they are relatively ineffective when faced with imported and endogenous instability, they are indispensable for tackling natural instability. Without them it is impossible to combat sustainably and effectively the instability induced by natural hazards. They also play a major role in rendering the price instability of perishable and non-tradable products more manageable given that the price of these products is very difficult to stabilize by market instruments (storage and long-distance trade are both impossible) or by public interventions (neither public storage nor border controls can be used). But a major proportion of the caloric intake in some parts of Africa is provided by this type of product (cassava, plantain). A-instruments may provide a solution in the medium term by rendering these products more storable, tradable or substitutable with tradable goods.

But such instruments do not develop spontaneously. An environment conducive to their development must therefore be created. This environment rests on a multifaceted base: *i*) provision of the public goods necessary for A-instruments to function correctly (including a legal framework), *ii*) training and technical support, and finally *iii*) temporary subsidies to help the instruments reach the critical size to be attractive to producers and traders. This public support for A-instruments is best developed at a regional scale and in an integrated manner (*i.e.* by simultaneously supporting several complementary market institutions such as MIS, grading systems and warehouse receipt systems). Finally, investment in A-instruments should also be promoted by reducing

the uncertainty facing economic actors through *predictable* public interventions that aim to prevent prices from reaching extreme values (C-instruments). Here it should be underlined that once the development of A-instruments is sufficiently advanced (successful green revolutions, modern infrastructure and market institutions in place and operating correctly), this public support should be gradually reduced then withdrawn (namely subsidies and floor prices).

Finally, it should be noted that A-instruments alone are not enough to manage food price instability in DCs. In particular they are relatively ineffective when faced with imported and endogenous instability. Even in situations of natural instability, A-instruments alone are not enough. The scheme must therefore be supplemented through recourse to instruments of other categories.

2.2. B-instruments: a secondary role in DCs

B-instruments offered a great deal of hope in the 1980s and 1990s, following the liberalization of DC agriculture. Many thought, and still think, that the properties of these instruments (symmetry, flexibility and predictability) make them ideal candidates to solve the price instability problem. And it is true that these instruments allow economic actors to choose the combination (protection level, cost) they deem optimal for them. And this without affecting prices, and therefore without causing distortions in the economy.

B-instruments also have another virtue in that they are supposed to help stabilize prices and thereby be beneficial to a wider public than solely their users. When producers and traders use B-instruments, they reduce the risk that weighs upon them and this stimulates their investment in production, market infrastructure and storage. This ultimately may have a stabilizing effect on prices which is beneficial for all. This is what we called the (potential) multiplier effect of B-instruments.

We will begin by presenting the rationale of B-instruments. We will then examine the main types of B-instrument and the manner in which they can reduce the impact of price instability on incomes. We will then discuss the complementarity and substitutability relations between B-instruments and between these instruments and those in other categories. We will then address the question of the difficult emergence of B-instruments. We will then outline the advantages, limitations and perverse effects of B-instruments before drawing conclusions on the role they should be given in the food price instability management scheme.

2.2.1. *The rationale of B-instruments*

B-instruments aim to protect market actors (farmers, traders, processors and consumers) from price risk and, in the case of farmers, from production risks due to natural hazards.^[79] These instruments may also be used by States to protect themselves from balance of payment or budget imbalances caused by price instability or measures taken to counter price instability.

These instruments do not aim to reduce price and production instability, but simply to mitigate their impact on the income, investment and consumption of economic

[79] Instruments to hedge against harvest-related risk are included in the analysis because sometimes this risk correlates with the price risk (when harvests are good the price falls, and *vice versa*). Another reason is that harvest risk management may – in theory – have a stabilizing effect on prices (see 2.2.4, section on the “multiplier effect” of B-instruments).

actors. Most B-instruments act *ex ante*, i.e. before shocks occur. They aim to mitigate the impact of price or production instability on income. Other instruments (based on credit) act *ex post* by mitigating the impact of income instability on consumption and investment.

Two *ex ante* mechanisms can be used to mitigate the impact of price or production instability on income:

- *compensation*. Economic actors protect themselves by acquiring contracts that provide cover with regard to a particular variable that can be price (*futures*, call options, put options), harvest (crop insurance), climatic conditions (weather-indexed insurance) or revenue (revenue insurance). If the variable covered in the contract exceeds a certain upper or lower threshold depending on the case, the contract holder is granted financial compensation.
- *risk pooling*. Different economic actors agree to pool their risks. For example, a number of producers entrust a cooperative with the sale of their maize. This sells the maize at different times and at different prices but pays each of its members the average price obtained (for the grade they provided).

These two mechanisms ultimately rely on diversifying the risks by pooling them. This pooling can be made directly by market actors (as in the case of the cooperative) or through operators such as an insurance company, a bank or a futures market. In the latter case, market actors pay to transfer their risks to these operators (who accept to buy them because they are able to diversify these risks by pooling them).^[80]

Ex post, if producer and consumer incomes fall, they are provided with credit such that they may continue to consume and invest in production. The same applies for countries with the credit facilities provided by the IMF.

2.2.2. The different B-instruments

First, it should not be forgotten that there are many “informal” B-instruments. For example, risk pooling systems are used at a village community or social network scale (Fafchamps, 1992). If incomes fall, urban and rural households can often obtain credit from family or friends. “Informal” B-instruments play a vital role in developing countries, but are hampered by major limitations. Firstly, if losses are heavy, solidarity networks may not be able to compensate. Secondly, given that solidarity networks

[80] Another reason why economic actors trade risks is their different risk aversions. Here, hedging instruments allow risks to be transferred to actors who are the least risk-averse (and this improves risk allocation).

often consist of households living in the same region and sharing the same activities, a large number of the network's households may be affected at the same time by a price drop or a poor harvest. Thirdly, households may find it very difficult to continue asking their social networks for help if they have already been unable to pay back previous credit (or respond to aid received by counter-gifts). In other words, their social capital may be exhausted by repeated crises. "Formal" B-instruments are therefore needed to complement "informal" B-instruments.

Formal B-instruments may be divided into three categories depending on whether they act *ex ante* or *ex post* and, for *ex ante* instruments, whether they protect from price risk or production risk. It should also be noted that "mixed" instruments can be used to protect both against price risk and production risk. This is in particular the case for revenue insurance. But this instrument is particularly complicated to implement in developing countries given the information it requires about farm accounts. For this reason, it is not included in the table below.

Table 6 Types of B-instruments

		Smoothing time	
		<i>Ex ante</i>	<i>Ex post</i>
Type of risk	Price risk	B1. Forward contracts	B7. Credit (including microfinance)
		B2. Futures	
		B3. Call and put options	
		B4. Risk pooling	
	Production risk	B5. Crop insurance	
		B6. Weather insurance	

Source: author.

Forward and futures contracts are contracts by which actors undertake to sell a defined quantity of a given product at a future date. Most of the time these contracts do not lead to any actual deliveries, they simply allow buyers and sellers to hedge price risk. It is of course possible for a supplier and his customer to agree a price today for a transaction that will take place several months hence. This guarantees the sale price for one actor and the purchase price for the other. The difficulty lies in bringing together business partners who have compatible expectations. A buyer

who expects prices to rise must find a seller *i*) who possesses the desired quality and quantity of product *ii*) who expects prices to fall sufficiently to be willing to agree with the buyer a future price that is acceptable to both parties. This difficulty is of the same nature as that in barter transactions where he who wishes to sell A to buy B must find a business partner with symmetrical needs. Like for bartering, the solution lies in disconnecting the two transactions.

This is precisely the role of forward contracts and futures. Let us take the example of maize producers looking to hedge price risk. In t_0 , they sell futures contracts by which they undertake to deliver a given quantity of maize on a given date. These contracts virtually never result in a delivery as producers prefer to deliver their maize to their regular customers. At term, the producers clear their position by buying similar futures contracts. If the price has indeed fallen, then the producers receive from the futures market the difference between the price of the futures contracts at t_0 and that at term. This payment thus offsets the loss they suffer on the physical market due to the price drop. If on the other hand the price has increased, it is the producers who must pay the difference to the futures market. This offsets the gain they make on the physical market.

Two types of contract are used: over-the-counter (OTC) contracts or forward contracts, and futures contracts traded on organized markets. There are two main differences between them. Firstly, the negotiation is bilateral for forward contracts, whereas it is multilateral for futures (on futures markets, all offers and bids are brought into connection). Secondly, futures, unlike forward contracts, are standardized: all contracts concern the same volume of goods (e.g. 100 tonnes for maize on the SAFEX), and the possible terms (generally five per year) are fixed. Forward contracts correspond more closely to the interests of both parties (the advantage of being "tailor-made"). Futures on the other hand have two advantages over forward contracts. First, they allow actors to more easily clear their position prior to term because the fact that the contracts are standardized makes it far easier to find a counterpart. Second, the risk of defaulting on futures is virtually nil as the futures markets are accompanied by clearing houses. A (rapidly growing) intermediary category is also used: standardized OTC contracts. Like conventional OTC contracts, they result from a bilateral negotiation, but, like futures, they use the standards in force on organized markets. The main advantage in this standardization is the capacity to use the clearing houses that come with organized markets.

Forward contracts and futures are therefore means for producers to hedge against price drops. The same mechanism is used, but in the other direction, for buyers who

are looking to hedge against price rises (they buy futures). The disadvantage that comes with this instrument is that although it protects producers (or buyers) from price decreases (or increases), it also prevents them from benefiting from increases (or decreases). This is why call and put options were developed.

Call and put options are instruments that provide the right, but not the obligation, to undertake a transaction in the future at a price set in advance. For example, a put option gives its holder the right to sell a certain volume at price p^* established in advance. Let us consider the case of a maize producer. He hedges by buying a put option. If the price falls below p^* , the producer exercises the option and sells at p^* . Otherwise, he sells at the market price. The put option therefore allows sellers to guarantee themselves a floor price. Likewise, the call option allows buyers to guarantee themselves a ceiling price.

Box 8 SAFEX: an African success story

The South African Futures Exchange (SAFEX) was founded in 1988 at the initiative of 31 banks and financial institutions. It initially dealt only in currency and financial products. SAFEX's agricultural division was set up in 1995. The first futures contracts for white and yellow maize were introduced in 1997, and options on futures were subsequently introduced. Large numbers of storage locations were registered for the purpose of delivering commodities, using "SAFEX silo certificates" (*i.e. warehouse receipts*). Call and put options for agricultural products date back to March 2008. The main commodities traded by SAFEX are maize (white and yellow), wheat, sunflower seeds and soybeans. The standard lot sizes per contracts are 100 tonnes of maize, and 50 tonnes of wheat and sunflower seeds and 25 tonnes of soybeans. In 2008, SAFEX traded futures and options contracts representing about 216 million tonnes of commodities, *i.e.* about 18 times South Africa's typical annual production of the relevant crops. Only a small and continually declining portion of these contracts end with physical delivery.

Can the success of this South-African experience be repeated elsewhere in Africa? Not easily. South Africa is a very specific case as its grain production is dominated by about 30,000 large-scale, cash-crop farmers, and about 70% of the storage capacity is provided by two large silo operators. Other African exchanges have so far only developed spot contracts.

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Another way to hedge price risk is through **pooling**. Here, different economic actors get together in order to pool their risks. As we already mentioned above, a typical example of pooling is collective commercialization through a cooperative, with the cooperative paying each of its members the average price obtained.

Two instruments may be used against production risk (induced by natural hazards): conventional crop insurance and index-based insurance (that is often “weather index-based” insurance).

Crop insurance serves to protect producers from the variability of yields caused by the effects of natural hazards. Payments (and premiums) are calculated on the basis of individual yields in the past. In practice, for reasons that will be explained below, private insurance companies are reluctant to offer crop insurance. Therefore, any development of this tool requires either subsidies (see the example of the USA), or implementation by the State (see the example of Nigeria, box 9).

Box 9 *An example of agricultural insurance in Africa:
the Nigerian Agricultural Insurance Corporation (NAIC)*

The Nigerian Agricultural Insurance Corporation (NAIC) is fully owned by the Federal Government of Nigeria. It was established in 1987 to provide cover to Nigeria's farmers for production risk stemming from natural hazards. It ensures a prompt payment of appropriate indemnity (compensation) sufficient to keep the farmer in business after suffering a loss. This initiative was taken in response to the unwillingness of conventional insurers to accept agricultural risks, which they considered too high.

The scheme began with the underwriting of two crops (rice and maize) and two live-stock commodities (cattle and poultry). It gradually broadened its scope to cover most crops and animals, including export products such as cacao, tea, coffee and rubber. The corporation provides up to 50% subsidy on the premiums, from grants by the State. The insurance of other agricultural activities (e.g. fisheries, horticulture) is currently being proposed as a pilot project. NAIC is also diversifying its portfolio by offering other types of insurance (fire, car, etc.). The corporation has, since inception, issued almost a million policies with the volume of risk amounting to about 100 billion naira (more than €486 million), thereby earning the corporate a premium sum of about 2 billion naira (€9.7 million).

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Source: NAIC 2009, <http://nigerianagricinsurance.com>

Weather insurance aims to overcome the obstacles that block the development of conventional crop insurance. This is made possible by the fact that weather insurance, for reasons that will become apparent later, is less risky for insurance companies than crop insurance. If covered by a weather insurance policy, farmers receive payments if a given climatic index (generally rainfall-related) falls below or climbs above a pre-defined threshold. Weather insurance belongs to the “indexed insurance” group of policies. The reference index may concern non-climatic variables such as vegetation indices (estimated using satellite pictures) or average yield for a given crop in the region where the insured producer operates (Halcrow, 1949). But in actual practice, all attempts made to develop indexed insurance almost exclusively concern weather insurance. Weather insurance is only in its infancy in developing countries. Simulation studies have for example been conducted for loans indexed on monsoons in India, for cattle insurance in Mongolia and for insurance indexed on rainfall in Morocco. Pilot projects based on drought indices have also been developed in Ethiopia, Malawi, Tanzania and Kenya (Banks, 2002; Chambers and Quiggin, 2002; Hess, 2003; Hess and Syroka, 2005; Skees *et al.*, 2001; Skees and Enkh-Amgalan, 2002; Osgood *et al.*, 2007; AFD-GRET, 2011).

Credit can be a very effective instrument for *ex post* income smoothing, *i.e.* when a shock occurs (Anderson, 2003; Devereux, 2001; IFAD, 2003). Credit firstly acts directly: agricultural households can borrow money to buy food when their income falls. It also acts more indirectly: agricultural households often use credit to buy the inputs they need for the activities that provide them with (part of) their income.

Here it should be underlined that these B-instruments may be used not only at a household scale but also for entire countries. For instance, instability may create balance of payments problems for certain vulnerable importing countries if soaring international prices or a poor domestic harvest cause the import bill to rise suddenly. The governments of these countries can use B-instruments to reduce this risk: if the country has protected itself from a poor harvest by weather insurance or from soaring international prices by a call option, it will receive financial compensation (in foreign currency) that maintains its balance of payments. The same applies if the country is granted credit facilities in “crisis” situations (the IMF procures such credit facilities).

2.2.3. Complementarity and substitutability relations between B-instruments

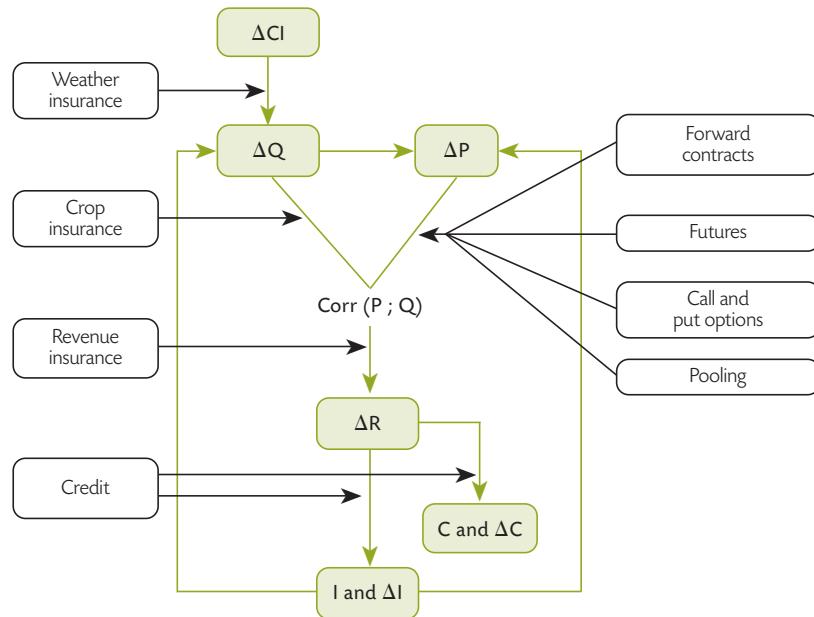
B-instruments, considered together, form a coherent set of tools and offer many possibilities to capitalize on their complementarities and substitutabilities.

The instruments that hedge different types of risk (price risk and production risk stemming from natural hazards) are complementary. Those that hedge against price rises (e.g. call options) are complementary to those that hedge against price falls (e.g. put options). Another form of complementarity involves instruments that act at different scales. For instance, a company that provides crop insurance or microcredit on a national or regional scale can in turn obtain cover from a company that operates on a larger scale, and thus hedges risks that are correlated at a local scale.

By contrast, B-instruments that hedge the same risk are substitutable. Their performance can be compared to determine which is the most effective in a given situation. For instance, different simulations have compared the effectiveness of futures and options (Faruqee *et al.*, 1997; Dana *et al.*, 2006; Sarris *et al.*, 2011). Various levels of protection may sometimes be offered. Risk-averse actors can therefore opt for the most protective (but more expensive) insurance policies or for put options that guarantee a higher floor price (or for call options that guarantee a lower ceiling price). To a certain extent, B-instruments that exert effects at different points in the risk chain are often in part substitutable. For example, in situations of natural instability, instruments that procure financial compensation for climatic hazards (ΔCl) are in part substitutable with those that hedge against production variability (ΔQ), price instability (ΔP) and revenue instability (that involves ΔQ , ΔP and the correlation between the two). Some degree of substitutability is also noted between these *ex ante* hedging instruments and credit that acts *ex post* to prevent revenue variability (ΔR) from affecting the level and variability of investment (I and ΔI) and consumption (C and ΔC) (see figure 16). However, it should be noted that credit also has complementarity relations with *ex ante* hedging instruments as access to credit is facilitated by their use (banks are more willing to lend money to farmers who have crop insurance).

Figure 16

Interactions between production risk, price risk and revenue risk, and impact point of the different B-instruments



ΔCI : climatic hazards

ΔQ : production variability (at the household level)

ΔP : price instability

$\text{Corr}(P; Q)$: (negative) correlation between price level and harvest volume (at the household level)

ΔR : household revenue instability

C : household consumption level

ΔC : variability of household consumption

I : household investment level

ΔI : variability of household investment

Source: author.

These complementarity and substitutability relations lend B-instruments very interesting properties and the full set of B-instruments therefore allows actors to hedge both production and price risk, and against price rises and price falls (symmetry). In theory, B-instruments allow economic actors to choose the combination (protection level, cost) they deem optimal for them, *i.e.* they provide flexibility. Finally, these instruments provide a certain degree of predictability to the extent that actors know in advance how much compensation they will receive if a certain crisis arises, and this without causing distortions given that, in principle, B-instruments do not affect prices.

On paper, these symmetry, flexibility and predictability properties make B-instruments highly effective. But in practice, things are far more complicated: many B-instruments are lacking or are inaccessible to DC market actors, or offer only partial protection from risk (2.2.5). This prevents DC producers, processors and traders from capitalizing on the complementarity and substitutability relations between B-instruments and removes a large number of their advantages.

2.2.4. Complementarity and substitutability relations between B-instruments and A-, C- and D-instruments

B-instruments have complementarity relations with all the other categories of instruments by completing them or – in theory – boosting their development.

Complementarity with D-instruments in risk hedging

We have already mentioned the complementarity between B-instruments and D-instruments (1.2.1) as these two instrument categories are intended *for different actors*. B-instruments are more aimed at producers, processors and traders whereas D-instruments are primarily for consumers. Also, B-instruments are aimed at actors who are able to pay for risk hedging, whereas D-instruments are in principle reserved for poor, vulnerable households. Some experts have also argued that these two instrument categories are intended *for different types of risks*, with “wild” (high and non probabilizable) risk requiring recourse to D-instruments (Cordier and Debar, 2004).

The same remarks could be made on a country scale. Private risk hedging instruments appear to be quite pertinent in emerging countries and maybe in the more wealthy DCs. The other DCs will require either assistance from the international community to enhance their access to B-instruments (see IMF payment facilities), or D-instruments to help vulnerable importing countries stabilize their food imports bill (1.6.1.). It can also be imagined that the range of countries with access to such public support (D-instruments or subsidies for B-instruments) could be broadened in the event of a particularly severe shock.

Complementarity with A-instruments

B-instruments in theory have the capacity to harmoniously complete A-instruments. Firstly, they in principle compensate for one of the negative effects of developing A-instruments: loss of the natural insurance that protects farmers. They also, in theory, have the potential to boost the development of A-instruments by stimulating producer, processor and trader investment, or by making the market more transparent.

Compensating for the loss of natural insurance caused by the development of A-instruments

The development of A-instruments in principle strengthens spatial arbitrage and this ultimately leads to a tighter connection between the different production and consumption areas on a national, regional or international scale. This is generally a good thing as long-distance trade ensures that deficits in some areas are compensated by surpluses in others, and thus avoids localized price rises and falls. However, this price stabilizing effect does not always stabilize producer revenues for in the absence of long-distance trade, the price in a production area correlates negatively with harvest volume. If the harvest is poor, prices rise, whereas if they are low, this means the harvest was good. Producers are therefore protected by a sort of natural insurance with the price risk and the production risk compensating one for the other. Growth in long-distance trade means that prices are harmonized on a large scale and production drops in a given area are no longer compensated by higher prices. Loss of this natural insurance may exacerbate the instability of producer revenues (Newbery and Stiglitz, 1984) and their recourse to price risk and harvest risk hedging instruments is therefore more useful. Growth in A-instruments may therefore increase the usefulness of B-instruments.

The "multiplier effects" of B-instruments

B-instruments can in principle be used by market actors to protect themselves from income drops caused by harvest variability and price instability. This theoretically will stimulate investment in production and storage, and in infrastructure and market institutions. If enough producers and traders use B-instruments, this will have a stabilizing effect on prices, from which everyone would benefit (see figure 16: I and ΔI have a stabilizing effect on ΔQ and ΔP). But this multiplier effect depends on a certain critical mass being reached in terms of the development and use of B-instruments, and this mass is virtually never reached in DCs. Looking back into the past, not one single example can be found of a green revolution being stimulated by the massive use of B-instruments. History tends to show that it is only once a country has accomplished a structural transformation of its agriculture that its producers

can use B-instruments. The practical scope of this multiplier effect is in actual fact extremely limited, even though the mechanism remains theoretically possible.

B-instruments may have a stabilizing effect on prices through another channel: by providing information. Here, futures markets generate information inasmuch that the price of futures is an aggregate indicator of expectations for the price in the future. This works as follows. Those who expect prices to fall sell the futures contracts that committed them to delivering a given quantity on a given date (they are said to be "short"). At the same time, those who expect prices to rise buy the futures contracts (they are "long"). As the market establishes an equilibrium between supply and demand for futures, the equilibrium price is an aggregate indicator of all expectations for the price in the future. Economic actors use this indicator as a guide, particularly for temporal arbitrage (choosing the right moment to buy and sell, and taking decisions about storage). This "price discovery" function of futures markets helps make markets more transparent, and therefore more stable. ^[81]

Complementarity with C-instruments and D-instruments: reducing the passing on of instability to the State budget

State policies implemented in the face of price instability may affect its budget, and this applies regardless of whether these policies are stabilizing (C-instruments) or protective (D-instruments). For example, when the State lowers import tariffs in response to soaring international prices, this reduces its revenue. The instability has thus been passed from prices to the State budget. The State can use B-instruments to handle this problem, with the cost of some public interventions being then partially compensated by the money received from insurance companies or futures markets.

However, very little experience has been acquired in this field and to the best of our knowledge is currently restricted to three examples: the purchase and use of a call option for maize by the Malawi government in 2005 (see box 10), the use by the WFP of weather insurance in Ethiopia in 2006, and the Mexican government's purchase of maize futures in December 2010.

[81] Even if, as we shall see later, this "price discovery" function runs the risk of creating speculative bubbles.

Box 10 *Use of B-instruments by governments:
Malawi's experience (2005-2006)*

In response to the 2005-2006 deficit, the Malawi government purchased a call option from a South-African bank. The option gave it the right, but not the obligation, to buy a maximum of 60,000 tonnes of maize deliverable to Malawi at a price fixed at 283 USD per tonne. The premium was 9%. The bank protected itself by hedging maize price risk on SAFEX. The operation proved to be most profitable as local prices rose to 50 to 90 USD above the option exercise price (against a premium of only 25.50 USD per tonne). At the same time, Zambia had to import at far higher prices. This success story shows that the Malawi Government could advantageously use this financial instrument even though it could only partially hedge the risk (as the price of maize on the domestic market in Malawi is only partially correlated with its price on the SAFEX). The question nevertheless arises as to whether this experience can be repeated. Since 2005, no government has attempted to imitate Malawi. And Malawi itself has not repeated the experience! Perhaps it should not be forgotten that in 2005 the operation received considerable technical support from the World Bank and that the cost of the option was covered by the UK Department for International Development (DfID).

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Sources: Dana et al. (2006); Dana et al. (2007); CRMG (2008).

2.2.5. *The difficult emergence of B-instruments*

Despite their potential benefits, B-instruments are very seldom used in developing countries. For example, the only futures market in Africa for agricultural products is that located in South Africa (the SAFEX). Agricultural insurance is virtually unknown, except at the State's initiative (as in Nigeria with the NAIC, see box 9). Several pilot projects of a limited scope are nevertheless ongoing with support from the World Bank or other donors. Also, when such instruments do exist, they are often seldom used. A typical example is the contract set up for rice on the Agricultural Futures Exchange of Thailand (AFET White Rice 5%) that often has no price quotes because of a lack of trade. This failure to develop and use B-instruments contrasts strikingly with the immense hope that was placed in these instruments following the liberalization of DC agricultures (see box 11). We will now describe the obstacles that hinder the development and use of B-instruments, and solutions that could be used to overcome these obstacles.

Box 11 *The paradox of "collars"*

In the 1990s, a few years after international commodity agreements (ICAs) had been abandoned, some experts were predicting that price-risk management instruments (futures, options) were about to undergo spectacular growth. One particular instrument appeared to have a very promising future: collars (Plaisance, 1995). A collar is a combination of a put option and a call option. In theory, this instrument is able to provide market actors with *flexible* and *almost free* protection against price instability since the floor price (the put option strike price) and the ceiling price (call option strike price) can be fixed in such a manner that the collar costs virtually nothing (intuitively, in order to benefit from a floor price, the producer accepts to put up with a ceiling price). It is also possible to offer several collars of different amplitudes in order to best satisfy different actors (the most risk-averse producers can choose "tight" collars that offer the highest floor prices, but lower ceiling prices). Collars therefore appeared to be able to provide what public stocks had promised (a band within which price fluctuations could be confined) without the inconvenience of these public schemes (their sometimes elevated cost and their rigidity, the floor price and ceiling price being the same for all market actors). More than 20 years later, it must be recognized that this miraculous tool has not seen the spectacular development that was expected.

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Main obstacles to the emergence and use of B-instruments

The failure to develop agricultural insurance can mainly be explained by the high risk involved for insurance companies. These companies calculate probabilities when estimating the risks they run. To do this, they need to know what probability there is of natural hazards leading to poor harvests. But the information necessary to calculate these probabilities is not always available in DCs. Also, three factors tend to heighten this risk: adverse selection, moral hazard, and the systemic nature of the risks run by producers. *Adverse selection* is the expression of the fact that those producers who run the greatest risks are more likely to seek insurance. The risk run by the insurance company is therefore increased. *Moral hazard* means that insured producers may make less effort to protect their harvest from bad weather, pests or disease, for if problems arise, their losses will be compensated by the insurance company. *Risk may be said to be systemic* when producers in a given area suffer poor harvests at the same time because all are affected by the same natural hazards (drought, attacks by locusts, etc.). In these situations of correlated risks, it is very difficult for insurance companies to diversify risks.

The failure to develop futures markets can be explained by the fact that, to operate, these instruments require fairly sophisticated and already functioning market institutions such as grading systems, warehouse receipt systems and commodity exchanges for spot contracts. But, as previously mentioned, the emergence of these A-instruments also runs into many obstacles (2.1.5).

In addition, even when B-instruments are in place, they are sometimes seldom used. For instance, DC producers and traders very seldom use current futures markets such as the Chicago Board of Trade (for wheat and maize), the South African SAFEX (for maize) or the AFET in Thailand (for rice). This is partly due to the cost and technical complexity of B-instruments (futures, options). Another factor involved is basis risk. Because of differences in quality and geographic situation, the prices in force in a given country only partially correlate with those on the futures markets (Larson *et al.*, 2005; Byerlee *et al.*, 2006), and this reduces the protection afforded by futures and options. The effectiveness of risk pooling systems is reduced if the risks run are correlated in time or space. Also, their advantages are sometimes reduced by the administrative costs of collective commercialization (Anderson, 2003). Sometimes B-instruments are in place but many economic actors are denied access to them. This in particular is the case for credit, for which many producers are unable to provide the required collateral.

Facilitating the development of B-instruments

Solutions reside in *i*) adapting B-instruments to match the needs of DC economic actors, *ii*) creating new, more efficient instruments or *iii*) capitalizing on the complementarities between instruments (particularly through reinsurance).

B-instruments can be adapted by their downscaling. For instance, microcredit is better suited to the needs of DC producers, traders and consumers than is conventional bank credit. In the same manner, efforts may be made to develop systems of micro-insurance.

New B-instruments could be created to overcome the limits of the old. This for instance is the case for weather-indexed insurance that reduces the adverse selection problems posed by conventional agricultural insurance (Miranda, 1991; Skees *et al.*, 1997). Also, as producers cannot influence the factor that results in indemnification payments (e.g. rainfall), the problem of moral hazard no longer arises. In addition, this type of system is subject to few administrative costs (it does not require the inspection of individual farms). However, weather insurance has its own limitations. Firstly, it only partially hedges risk since harvest volume for a given producer only partially correlates

with the weather index: this is the correlation risk (Sarris, 2008). Another limitation stems from how the index is constructed: it needs a great deal of historical data that are not always available in DCs. The index must also be measured objectively and precisely, and must be available in real time.

Complementarities between B-instruments offer the opportunity to employ certain B-instruments to boost the development or use of other B-instruments. For example, agricultural insurance may facilitate producer access to credit. But it is above all through reinsurance that complementarities come into their own. Reinsurance means that suppliers of B-instruments can themselves use B-instruments to protect themselves. This is for instance the case when an insurance company or a microfinance institution that operates locally seeks protection by recourse to weather insurance. It is thus able to manage the systemic risk of a natural hazard affecting all the producers in the area where it operates (Bielza *et al*, 2006). This obviously needs the presence of insurance companies operating on a far larger scale such that they can diversify the weather risk. In a similar vein, a trader who offers producers contracts that fix prices several months in advance can seek protection on the futures markets. The same reasoning can be extended to States. These provide producers and consumers with protection (through C-instruments and D-instruments) but run the risk of endangering their budget. They may thus manage this risk by recourse to B-instruments (see the example of Malawi, box 10).

In all cases, some public support is required if B-instruments are to be promoted. This support may take the form of technical assistance or even subsidies (see the example of pilot projects supported by the World Bank's Commodity Risk Management Group, CRMG, 2008). The question then arises of how to allocate public funds between B-instruments and the other instrument categories.

2.2.6. *The advantages, limitations and perverse effects of B-instruments*

The advantages of B-instruments

The main advantage of B-instruments lies in their complementarity with other instrument categories. We have already seen that B- and D-instruments are complementary in terms of type of user and type of risk, with B-instruments being more suited to major economic players and moderate, probabilizable risk, whereas D-instruments are more appropriate for small actors, consumers and "wild" risk (1.2.1). B-instruments are also complementary with A-instruments since B-instruments may promote their development through two "multiplier effects": by stimulating producer and trader

investments in production and market infrastructure and institutions and by increasing market transparency (thanks to the price discovery function of futures markets). Finally, B-instruments are complementary with C-instruments and D-instruments insofar that government use of B-instruments may prevent public interventions from generating instabilities in State revenue and expenditures.

The limitations of B-instruments

B-instruments have many limitations. They are difficult to introduce, and when they do exist only big producers and traders have access to them, not consumers or small actors. Moreover, use of these instruments is hobbled by their technical complexity and cost. Their use may nevertheless expand in the future given that the emergence of new instruments (such as weather insurance) and the reinsurance possibilities they offer could boost the use of other B-instruments. Caution is nonetheless required: B-instruments will at best be used only by a small proportion of producers and traders. The critical mass required to generate a multiplier effect will in all likelihood not be reached.

The perverse effects of B-instruments

B-instruments may also generate perverse effects that can increase price instability.

For instance, crop insurance may encourage producers to opt for higher risk production techniques (e.g. varieties more sensitive to weather hazards). Other B-instruments may to a certain extent pose the same type of problem (for the case of futures markets, see Newbery, 1987). In these cases, the development of B-instruments can exacerbate price instability.

Futures markets, on the other hand, are liable to create speculative bubbles. We have already seen that the price of futures is an aggregate indicator of all expectations for the price in the future. This indicator is in principle a good thing in that it serves as a guide for economic actors, but it can also lead to the emergence of speculative bubbles. If the price of futures rises, market participants may be tempted to revise their own expectations upward (thus following the dominant market opinion), and therefore buy futures, which drives the price up. Price rises therefore tend to engender additional rises, which can lead to speculative bubbles. The risk of speculative bubbles is therefore intrinsic to futures markets: this is the price to pay for the advantages these markets offer (hedging price risk, price discovery).

The risk of speculative bubbles is accentuated by the arbitrage of "non-commercial" operators, *i.e.* those not involved in physical transactions. These practice arbitrage between agricultural products ("ags"), energy products and securities. The strategy of these operators is to diversify risk by managing a portfolio of futures for different

products whose prices are uncorrelated. But their arbitrage leads to bubbles spreading from one product to another. For example, in times of crisis on the securities markets, operators may be tempted to switch to "ags". But their buying causes prices to rise on agricultural commodity futures markets and this may lead to the formation of speculative bubbles. The trading of indices based on baskets of energy and agricultural commodities may also encourage the spread of bubbles from energy markets to agricultural commodity markets.^[82] The risk of speculative bubbles may be reduced by making futures market operators less responsive to price movements. This can be achieved by quantitative limits (position limits on non-commercial operators) or taxes (Tobin type taxes on futures transactions).

Here it should also be specified that price variations on futures markets are in general automatically passed on to physical transactions since prices on the futures markets are generally used as a reference in international trade: what importers and exporters negotiate is a (positive or negative) differential with regard to the price on the futures market. Speculative bubbles developing on the futures markets thus cause price instability for agricultural commodities traded on international markets.

2.2.7. What can we achieve with B-instruments?

In conclusion, what must States and donors do with B-instruments? The considerations given above lead us to make three recommendations:

1. B-instruments should be pushed to their limits, *i.e.* their development and use should be promoted. The development of B-instruments often requires public support and may involve direct management (see box 9 for the example of the NAC in Nigeria), either by subsidies or simply by providing the necessary public goods (e.g. development of a climate index). But the approach adopted must be realistic and consists, for example, in encouraging the development of micro B-instruments (reinsured by B-instruments operating on a larger scale). With regard to futures markets, this consists in advancing step by step: futures markets can only emerge after a long process of market modernization (they can only be envisaged when preceded by grading systems, warehouse receipt systems and commodity exchanges for spot contracts, *cf.* 2.1.5). The use of B-instruments can be supported by training (often required given the complexity of these instruments) and subsidies. But the opportunity cost of the public money invested to support the development or use of

[82] This in particular is the case of the Standard & Poors - Goldman Sachs Commodity Index (S&P-GSCI) and Dow Jones – AIG Commodity Index (DJ-AIG). Agricultural commodities account for a small percentage of the value of these indexes. Changes in the prices of these indexes are therefore due primarily to changes in energy prices, but these changes affect the value of the agricultural commodity futures.

2. Selecting the right instruments for strategy implementation

B-instruments should also be considered. The stabilizing effect on producer or consumer income could doubtless be greater were this money to be invested in the three other instrument categories.

2. B-instruments should be used to counter the public expenditures instability that springs from price instability management policies based on C- and D-instruments. This State use of B-instruments often requires external technical support, as illustrated by the case of Malawi (see box 10). Given that little experience has been acquired in such matters, this approach should first be tested through pilot projects before large-scale implementation is envisaged.
3. The perverse effects of B-instruments should be reduced. This consists in particular of encouraging weather insurance rather than crop insurance which may have the effect of leading producers to be less careful when protecting their crops, thus increasing price instability. Futures markets also need to be regulated to decrease the probability of speculative bubbles. This regulation could take various forms, e.g. by imposing position limits on non commercial operators or by taxing transactions (through a Tobin type tax). These efforts to regulate the world's different agricultural commodities futures markets could be facilitated by international coordination (see 1.6.).

Altogether, B-instruments should be encouraged, but their potential should not be over-estimated, *i.e.* they should not be a key part of the scheme. B-instruments should account for only a small proportion of the money invested in managing price instability. Contrary to the recommendations of the "optimal strategy" (see 1.2.1), B-instruments should play only a secondary role, serving to complement the other instrument categories.

2.3. C-instruments: necessary to guarantee food security and stimulate green revolutions

Back in the time when the “optimal strategy” was shaping all thinking on how food price instability should be managed, C-instruments were simply taboo. But since the 2008 crisis, they have at least in part been rehabilitated. The idea that public interventions should be implemented to stabilize prices has been considered as absurd ever since the 1980s. Did not Newbery and Stiglitz (1981) demonstrate that price stabilization runs the risk of reducing social welfare? Did not the lapse or collapse of the International Commodity Agreements (dropped in the 1980s) confirm that it is impossible to stabilize prices in the long term, at least at an international level? Some experts nevertheless continued to defend stabilization either for food prices on DC domestic markets (P. Timmer), or for agricultural markets in general (J.-M. Boussard). And, since the 2008 crisis, the virtual consensus against C-instruments has been seriously shaken. Testimony to this is the fact that mainstream economists working for international organizations have suggested that C-instruments should be used to reduce the instability of international grain prices (Von Braun and Torero, 2008, 2009a and 2009b; Lin, 2008; Von Braun, Lin and Torero, 2009). The topic today is once again open to debate. But C-instruments are still controversial, with some economists underlining how the perverse effects of public interventions can in certain cases increase price instability (Chapoto and Jayne, 2009).

We will first look at the rationale of C-instruments. We will then describe C-instruments in detail and the characteristics that set them apart one from the other. We will then devote the next two sections to complementarity and substitutability relations, firstly between C-instruments, then with the instruments in the other categories. We will then address the question of the obstacles hindering the use of C-instruments. Finally, we will outline the advantages, limitations and perverse effects of C-instruments before drawing conclusions on the role they should be given in the food price instability management scheme.

2.3.1. The rationale of C-instruments

What can public authorities do to stabilize prices? One approach is *to fix prices in an authoritarian manner* (administered prices, price control). This is not a good solution as measures such as these often cause disequilibria (excess supply, or even worse, deficient supply).

Another approach is *to render the demand for food staples more sensitive to price movements*. Let us consider the case where there is a deficit in supply. If demand

falls sharply when prices rise, then a moderate price rise will suffice to restore the equilibrium between supply and demand. But, given that we are talking here about food staples in DCs, this is neither possible nor desirable. One of the aims of price stabilization is precisely to prevent any contraction of household demand for food. It is only when these goods are employed for other usages than human food that more elastic demand may be desirable. This is the case when food products are used for biofuels or, to a certain extent, to feed animals. However, the question of biofuels does not yet often arise in developing countries.^[83]

The third, last and only pertinent approach consists in *regulating supply by compensating for deficits or absorbing surpluses*. This is precisely the rationale of C-instruments.

2.3.2. The different C-instruments

C-instruments therefore aim to stabilize prices by regulating the supply. This can be done through action on the different components of the supply: *i*) production, *ii*) private stocks, *iii*) public stocks *iv*) trade with other countries (imports and exports). For each of these components, action can be taken through measures affecting prices (taxes or subsidies) or quantities. C-instruments may thus be classified as follows:

Table 7 Types of C-instruments

		Channels of action	
		through prices	through quantities
Variable-target	Production	C1. Variable taxes and subsidies on inputs or production	C2. Variable quotas on inputs or production
	Private stocks	C3. Variable taxes and subsidies on consumption	C4. Requisitions
	Public stocks	C5. Use of public stocks: purchases, sales, free distribution	
	Imports or exports	C6. Fixed or variable taxes and subsidies on imports and exports	C7. Fixed or variable quantitative restrictions on imports and exports (bans, quotas, licenses)

Source: author.

[83] The main food products used to produce biofuels are maize (almost exclusively in the USA), rapeseed (above all in the European Union) and sugar (mainly in Brazil). The use of food for biofuels production could be regulated in these countries by playing on mandates and subsidies (Wright, 2010).

2.3.3. Complementarity and substitutability relations between C-instruments

Table 7 can be used to analyze the complementarity and substitutability relations between C-instruments. A column analysis can be used to compare instruments that act through prices with those that act through quantities, whereas a line analysis compares instruments based on the supply component they affect. Let us consider these one after another.

Acting through prices and/or through quantities (*column analysis*)

At first sight, it would appear that the instruments acting through prices and those acting through quantities are *substitutable*. For example, imports may be reduced either by using tariffs or quotas. The question then arises as to the comparative performance of the two types of instruments.

Generally speaking, instruments that act through prices should be preferred as they have the advantage of being *more transparent*: they are often triggered in response to price changes (if prices reach a floor or a ceiling), whereas quantitative measures tend to be based on estimations of needs and availabilities. But prices are generally public information whereas estimations of quantities require statistical data that are unavailable to private actors and may be of doubtful quality. Such information may also be manipulated as illustrated by the controversy surrounding grain balance sheets in Sahel countries. Public interventions are therefore more predictable if they are triggered by price changes. Furthermore, the effect of quantitative measures on prices is more difficult to predict than that of subsidies or taxes. This has consequences for policy-makers (who may less accurately anticipate the consequences of their action), and also for private actors. Quantitative measures are therefore more likely to depress private stocks (crowding out effect).

Another advantage of using instruments that act through prices is their *symmetry*: they are able to combat both price rises and price falls. When a reduction in taxes proves insufficient, subsidies can always be brought into play. By contrast, the effectiveness of quotas is limited by the fact that once all quotas have been removed, it is impossible to further increase quantities.

The main argument in favor of quotas lies in their practical feasibility. Experience has shown that *quantitative measures are less difficult to enforce* than tax-based measures: it is easier to monitor trucks and boats than the payment of a tax. An example of this is provided by India which in October 2007 attempted to establish minimum export

prices. As these prices were higher than those in force at the time on the international market, this should in theory have stopped all exports. In actual fact, exporters were able to get round the measure, and this so comprehensively that India in April 2008 announced that it was banning exports, which proved effective (Timmer, 2010a).

Another reason that could justify recourse to quotas lies in the *symbolic reach of these measures*: the message sent by an export ban is very different from that conveyed by a tax on exports. A ban sends the message that the State is looking to protect its population from famine, whereas taxes on the other hand suggest that it is taking advantage of a difficult situation to increase its tax revenues.

However, it should here be specified that C-instruments which act through prices and those which act through quantities may to some extent be *complementary*. For example, subsidies may be introduced that are limited to a certain quantity.

Acting on production, stocks and/or on foreign trade (*line analysis*)

Instruments that impact production, stocks and foreign trade are seemingly substitutable. But, as we shall shortly see, they are also to a great extent complementary. We will kick off by discussing the advantages and disadvantages of each of the different variable targets for C-instruments (in terms of effectiveness, timeline, cost and perverse effects), before returning to a discussion of their substitutability and complementarity.

Some C-instruments aim to stimulate **production** when prices rise. This in particular is the case for conjunctural input subsidy programs (activated only when prices soar).^[84] It is doubtful that such programs are effective. Firstly, they are set up in an emergency and may face logistic problems that compromise their effectiveness (see the stimulus packages for rice production used by many West African countries in 2008). This problem may be resolved by setting up a structural scheme to subsidize inputs where subsidies are increased in times of crisis (see Indian and Chinese schemes: OECD, 2009; Dawe, 2010). Also, even when logistic problems are overcome, these programs may not have the expected benefits: producers may resell the inputs or not use them in the right manner. Or the weather may be unfavorable. Finally, even if these programs do have the expected effect on production, this will only occur several months later.^[85]

[84] We are dealing here with non-targeted and conjunctural input subsidy programs. As already mentioned above, targeted input subsidy programs are D-instruments (their aim is to maintain the production capacity of vulnerable households), whereas structural programs are A-instruments (their aim is to facilitate production modernization).

[85] This timeline can sometimes be reduced by expectations: if economic actors expect the coming year to provide a bumper harvest, this encourages them to sell their stocks. This helps drive prices down before the new harvest hits the markets.

These conjunctural input subsidy programs also have another drawback: by amplifying the supply response to price rises they may cause a cobweb effect.^[86] Altogether, it seems preferable to make input subsidies a structural instrument for the promotion of agricultural modernization (A-instrument), rather than a conjunctural tool to boost production in periods of deficit (C-instrument). Production therefore does not appear to be an appropriate target for price stabilization policies.

The State may act by encouraging or discouraging the sale of **private stocks**. For example, private stocks may be requisitioned but the mere possibility of such a measure is likely to greatly discourage private storage (crowding out effect). The State must therefore abstain from requisitioning stock, or only in extreme situations (major humanitarian disasters). The State may also influence the selling price of private stocks by manipulating taxes or subsidies on consumption. For instance, a temporary reduction in VAT should in principle lead traders to decrease their selling prices (if the market is competitive). But the measures necessary to counter price surges (VAT reductions, subsidies) are very costly as they apply to all volumes consumed.^[87] Also, their effects are uncertain if there is no guarantee that traders will pass on the reduction to consumers. Finally, private stocks cannot be relied upon to counter speculative bubbles or panics as these situations are precisely characterized by private actors retaining stocks. Private storage is not therefore an appropriate target for price stabilization policies.

Interventions based on **public stocks** always have an effect on quantities, either by reducing the quantity available on the domestic market (through purchases) or by increasing it (through sales or free distributions). If, in addition, interventions take place at a price that is different from that in force on the market, the action through quantities is accompanied by an action through prices (e.g. free distributions, moderately priced sales, etc.).

A distinction here should be made between buffer stocks and emergency reserves. Whereas the former aim to stabilize prices (C-instruments), the latter are used for public interventions targeting vulnerable populations (D-instruments). This distinction may in practice be difficult to make as certain countries build up buffer stocks (stigmatized by the international community, at least until 2008) by passing them off as emergency reserves. The two stock types serve very different purposes. Emergency

[86] The same problem arises if, instead of providing conjunctural input subsidies, land reserves are built up that are only cropped when prices soar (following the proposal put forward by A. Sarris to stabilize international prices).

[87] It should be specified that should VAT be levied only on imports (as is the case for grain in certain West African countries), then changing VAT levels is equivalent to changing customs duties.

reserves are in principle activated when early warning systems signal the risk of a food crisis for a given region or social group. Early warning indicators are often built by crossing data on food production, food prices, the price of assets that deficit households can sell to buy food (e.g. small ruminants) and sometimes health data (dispensary attendance levels). Sales or free distributions target vulnerable households or regions. By contrast, buffer-stock interventions are untargeted and mainly guided by changes in prices. The difference between these two public stock types is illustrated by the example of Mali (see box 12).

Public stocks also differ with regard to other parameters. Firstly, *the scale* on which they are managed. This may be international, regional, national or local (see the case of the cereal banks in Mali, box 12). Public stocks (particularly emergency reserves) may be *co-managed with donors* through the dual signature principle (see box 21 for the example of the *Programme de Restructuration du Marché Céréalier* [PRMC – Grain market restructuring program] in Mali). Another very important parameter is the availability of sufficient *working capital* for rapid buying. Finally, the choice of which *products are used to make up the stock* can prove crucial given that the different grains may be imperfectly substitutable. For instance, in Sahel countries, stocks made up of rice or millet will not have the same effect on the price of these grains: stabilizing interventions will therefore concern different producers and consumers. Finally, *the size of stocks* is obviously vital in their capacity to stabilize prices. However, in practice, these may be very different from one country to another. Public stocks account for less than 2% of grain production in Mali but have reached 30% some years in Zambia.

Box 12 *The different types of public stocks: the case of Mali*

Mali has three types of public stocks. They differ in terms of purpose, time constituted, governance, size and type of grain they contain (rice and/or millet-sorghum). The oldest is the *Stock National de Sécurité* (SNS). Its purpose is not to regulate markets but to serve solely for targeted interventions in high-risk areas. These interventions take place only if recommended by the Early Warning System (EWS) and if agreed by donors (dual signature). However as, for technical reasons, a third of the stock must be renewed every year, this means that about 10,000 tonnes of millet-sorghum are sold every year (during the lean period) and bought back (during the post-harvest period). These "technical rotations" may have a stabilizing effect on prices. The two other stocks (*Stock d'Intervention de l'État* [SIE] and cereal banks [GBs]) were set up in the aftermath of the "locusts crisis" of 2005. Unlike the SNS, they are made up of both millet-sorghum and rice and have the explicit aim of stabilizing prices. The SIE can be used at the discretion of the Malian government and is about 30,000 tonnes in size. Unlike the SNS, it does not have any working capital and must therefore obtain bank credit before buying grains. This means that timelines between purchasing decisions and effective implementation may be fairly long, often resulting in late purchases (when prices have already risen). GBs are managed locally in the 703 municipalities that make up the country. Decisions concerning the use of the 15,000 tonnes of grain stored in all the GBs are therefore highly decentralized. Altogether, the SNS, SIE and GBs account for less than 2% of the grain produced or consumed in the country.

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Public stocks offer two enormous advantages for price stabilization. First, they are very effective: if large volumes are bought or sold, the effect on prices is certain. Second, their effect on prices is immediate: it occurs as soon as grain is bought or sold, sometimes before (simply announcing a purchase or sale is sufficient to affect prices through market actor expectations).

The main drawback of public stocks is *their cost*. This stems from storage logistics (warehouses or silos, security, phytosanitary treatments, risk of losses or deterioration) to which should be added the financial cost of keeping a resource unused for several months. For large stocks, the cost may be very high. But large stocks are precisely needed in order: *i*) to mop up surpluses or make up for production deficits (in order to deal with natural instability or the cobweb), *ii*) to disconnect the country temporarily from the international market (in order to tackle imported instability) or *iii*) to control speculative bubbles and panics. In addition, when grain is purchased or sold at the same price across the territory (without considering transport costs), this may gene-

rate substantial distortions, prevent markets from functioning correctly and lead to ineffective resource allocation.

Public interventions may also take the form of the **regulation of import or export flows** through taxes-subsidies or quantitative restrictions (licenses, quotas, prohibitions). All these measures may be stable over time or variable. If stable, restrictions on international trade make the country more sensitive to internal causes of instability (natural hazards affecting production, cobweb, speculative bubbles on the domestic market) but protect it from external sources of instability. Their combined effect on price instability is therefore ambiguous and depends on the relative weights of internal and external causes.

In order to have a stabilizing effect under all circumstances, border measures should be variable, and under such conditions can be very effective in stabilizing domestic prices. This is obviously the case *when the instability is imported*: a variable tariff on imports may for instance fully compensate for fluctuations in international prices if indexed to the CAF price converted into local currency.^[88] The same result may to a certain extent be obtained by varying trade quotas. The effectiveness of such measures is clearly illustrated by the fact that wheat prices in China and India have been very stable over the last few years despite major fluctuations in international prices (see figure 8). But *variable measures on a country's borders may also be very effective in controlling instability of internal origin*, for example if national production fluctuates because of weather hazards or cobweb dynamics. In fact, by regulating import and export volumes, variable border measures can stabilize internal availabilities (1.3.2). These measures are also a means to rapidly increase internal availabilities in order to counter speculative bubbles and panics.

Here it should be specified that *there is a world of difference between ad hoc changes in tax levels or quantitative restrictions, and the use of indexed measures*. The former evolve in a discretionary manner whereas the latter evolve automatically by following changes in a predefined indicator (generally the international price or the domestic price). Indexed measures should therefore be preferred since *ad hoc* measures have two drawbacks. First, they are unpredictable and may therefore generate a crowding out effect: for example, the “threat” of lifting import tariffs may lead private actors to store less, and this in turn may increase price instability. Second, *ad hoc* measures are more difficult to “sell” politically. For instance, the decision to lift tariffs on imports may

[88] Full compensation nevertheless requires the tariff to become negative (i.e. switches into a subsidy) if international prices reach high levels.

run into opposition from the producers' lobby. By contrast, an indexed tariff is more balanced: producers may more readily accept a tariff reduction when international prices rise if they are guaranteed that the tariff will be increased if international prices fall.

Altogether, we see that production and private stocks are not appropriate targets for C-instruments, and that the most effective C-instruments are public stocks and variable measures taken on borders to regulate import and export flows.

Broadly speaking, these two instrument types may be considered as being *substitutable*, and this is further supported by the controversy surrounding their comparative performance. Border measures are equivalent to using the international market as a stock, and this lends such measures two valuable advantages. First, for "small" countries (whose imports and exports account for only a small proportion of international trade), the international market constitutes *an almost limitless stock*. Second, *border measures are less costly than public stocks* since public stocks generate costs every year (logistic costs and financial costs) whereas tariff exemptions or import subsidies only have a cost when brought into use.

But border measures in many situations may prove impossible, ineffective or costly. This in particular is the case: *i*) if the good is non tradable and poorly substitutable with tradable goods, *ii*) if the State finds it difficult to control its borders, *iii*) if the food products import-export sector is not competitive (the risk here is that tariff reductions or subsidies will not be passed on),^[89] *iv*) if the country's import capacity is restricted because of the low level of its foreign exchange reserves, *v*) if the country looking to stabilize prices is "large" in the sense of the theory of international trade,^[90] or *vi*) if the country is landlocked. The respective advantages and costs of public stocks and border controls are therefore very different depending on countries and products. In addition, it should be underlined that border measures generate negative externalities to the extent that they export instability onto the international market (we will return to this point later, see 2.3.6).

It should also be underlined that *public stocks and border measures may also prove to be very complementary instruments* and may thus be advantageously combined. Public stocks present the advantage of having a direct and instantaneous effect on prices. On the other hand, border measures are effective only if importers and

[89] This problem arises in many African countries when the import of rice and maize is in the hands of a very small number of private actors.

[90] If this country's imports or exports account for a large proportion of international trade, the international market no longer constitutes a limitless stock from which the country can draw what it lacks, or into which it can pour all its surpluses. The country is no longer a price-taker. Its imports, for example, drive up the international price.

exporters pass on tariff reductions or subsidies to their purchase or sale price. Their effects may only be felt after a few weeks or a few months (the time necessary for importers to obtain supplies and sell previously bought stocks). Public stocks may therefore harmoniously complete a stabilization scheme that is mainly based on border measures. In this case, public stocks are useful *i*) to prevent importers from capturing rents by not passing on tariff reductions or subsidies and *ii*) to manage the problems stemming from import timeliness. Also, as public stocks are never enough to control imported instability (1.3.2.), all stabilization schemes, even those primarily based on public stocks, must include border measures.

2.3.4. Complementarity and substitutability relations between C-instruments and A-, B- and D-instruments

Here in this section we will consider the complementarity and substitutability relations between C-instruments and A-, B- and D-instruments.

C-instruments and A-instruments: good complementarity but a high risk of crowding out

The effect of C-instruments on A-instruments is the subject of much controversy. Some experts believe that C-instruments stimulate the development of A-instruments whereas others consider that they supplant them. Both hypotheses are based on theoretical arguments and empirical evidences. As we shall see, and despite appearances, the two hypotheses are not incompatible.

Let us consider the first hypothesis. The central idea here is that *by preventing the price from falling too low, C-instruments pave the way to the development of A-instruments* since the creation and use of A-instruments relies on producers and traders making investments. But, both are risk averse: if the price risk is too high, they will forgo any investment. Also, even if they wanted to invest, the banks would be reluctant to give them loans. Using C-instruments to guarantee a floor price removes these two obstacles. As now more secure, producers and traders are more ready to invest and build up stocks. And as now reassured, the banks are more willing to lend. A certain degree of price stability is therefore a prerequisite to production and market modernization. This hypothesis is supported by solid empirical evidences: no green revolution in the past has ever taken place against a background of unstable prices. The green revolutions in Europe, North America and Asia that resulted in increased grain yields were nearly in all cases accompanied by schemes that held prices above a minimum level. A judicious policy to keep domestic prices stable is therefore likely to stimulate green revolutions and thus trigger a virtuous circle of economic development (Timmer, 1988; Timmer, 2009a). Indonesia is a good illustration of this (see box 13).

Box 13 *Price stabilization, self-sufficiency and food security: some lessons from the Indonesian experience*

Food security as a political concept requires an operational definition. In most Asian countries this has taken the form of domestic price stability relative to world prices, thus requiring state control over trade flows in rice. In order to minimize the need to resort to trade at all, and to avoid the uncertainties in the international price of rice, self-sufficiency has also become a popular objective, the more so as countries become rich enough to afford the protection implied by measures needed to implement policies that achieve greater degrees of self-sufficiency.

A further impetus toward greater domestic rice production has been the fear of food shortages in urban areas, which evoke a universal and visceral reaction. Governments are held accountable for provisioning cities at reasonable costs, and citizens have repeatedly demonstrated their capacity to bring down governments that fail in this obligation.^[91] It is acute food shortages – not the average level of food prices – that induce anti-government panics, however. Food shortages are simply the mirror image of sharp price rises.

Indonesia provides a particularly vivid case study of policy initiatives designed specifically to stabilize the domestic price of rice – using imports or domestic production to avoid food shortages – with a careful analytical debate paralleling the policy actions. The role of trade versus domestic production as the basis for food security has been analyzed and discussed in a surprisingly open and articulate manner since the beginning of the Suharto government in 1967.

The proximate definition of food security in Indonesia has always revolved around price stability, especially for the price of rice, the country's primary food staple. The analysis that underpinned this approach never focused only on the static and partial equilibrium consequences of changes in rice prices. Instead, an effort was made, even well before computable general equilibrium models became a standard tool of policy analysis, to consider dynamic and economy-wide ramifications of price policy, the distributional consequences for farmers and consumers, and the role of other commodities in the rice stabilization program.

Looking for food security and self sufficiency in rice

Self-sufficiency in rice and other foodstuffs such as sugar and soybeans has been a consistent (if often rhetorical) objective of Indonesian agricultural policy since the

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[91] The revolutions in Tunisia and Egypt in 2011 are only the latest examples. See Kaplan (1984) for a fascinating historical account of the relationship between urban masses and their rulers with respect to provision of basic foodstuffs.

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beginning of the New Order regime in 1967. Both historical and production cost data based on farm surveys confirm that self-sufficiency in rice is less costly (on average and over the long run) than rice imports from the world market, partly the result of a highly successful Green Revolution in rice production technology. Because of fluctuations due to weather (especially el Nino events), diseases, and pests, however, rice production in Indonesia is unstable and in any particular year can be above or below the normal level of rice consumption.

In order to stabilize the rice economy from production instability, as well as from sharp fluctuations in world prices for rice, BULOG, the Indonesian Food Logistics Agency, was charged to operate a floor and ceiling price policy using domestic buffer stocks as the balance wheel to smooth out year-to-year fluctuations in production and consumption. The goal was to keep rice consumption on a smooth trend despite unstable rice production. The primary policy instrument for stabilizing rice *consumption* is the stabilization of rice *prices*, which has been BULOG's most important task.^[92]

Successful stabilization of rice prices between a policy-determined floor and ceiling price requires an active and on-going analytical capacity – to determine the appropriate levels for the floor and ceiling price each year – that is directly linked to the political (and budgetary) decision-making process. Indonesia developed this capacity gradually through the early 1970s and 1980s, relying initially on foreign experts and eventually on local analysts, many of whom had returned from foreign academic training. Much of this analytical effort is now in the public record.^[93]

From the late 1960s until the early 1980s, imports of rice were used routinely by BULOG, as the balance wheel between supply and demand in its defense of a floor price and ceiling price for rice. The world food crisis in 1972-73 stimulated serious efforts to increase rice production, and the long-sought goal of rice self-sufficiency was achieved in the mid-1980s. Thus the balancing role of international trade was superseded by the problems of managing domestic buffer stocks as the sole mechanism for balancing seasonal and annual differences between production and consumption.^[94]

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[92] This approach works well when incomes are reasonably stable, but fails when there is an economy-wide collapse, as in 1998.

[93] See Timmer (2004a) for a summary and Timmer (2010a) for an evaluation of how Indonesian price policy changed between the food crisis in 1972/73 and that in 2007/08.

[94] It was President Suharto's determination to avoid rice imports that took international trade as a balancing mechanism off the policy agenda. Indeed, Indonesia was supposed to be "self sufficient" in rice – after all, FAO had given him a gold medal in 1985 for that achievement. By the early 1990s the President's economic advisors had convinced him that "self-sufficiency on trend" was a more appropriate policy objective, and limited imports again became operationally feasible.

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For the ten years of the fourth and fifth five-year development plans (REPELITA IV and V), 1983/84 to 1993/94, Indonesia was almost exactly self-sufficient in rice on average, and per capita availability (consumption) increased smoothly in all years but two. In none of the individual years, however, was domestic production exactly equal to consumption. In some years, for example 1984, 1989, and 1992, production was larger than consumption, and BULOG stocks increased. In other years, for example 1985 and 1993, production also exceeded consumption but, with BULOG warehouses full, exports were used to handle the surplus. In 1986, 1987, 1990, and 1991, consumption was slightly larger than production, and BULOG stocks were drawn down. In 1988, 1992, and 1994, production was again less than the desired consumption level and, with low BULOG stocks, external supplies were called upon to provide stability to Indonesia's rice markets.

The overall picture is one of stable growth in per capita rice consumption, relative stability in Indonesia's rice market, and perhaps most importantly from a political perspective, the achievement for the first time of self-sufficiency in rice (on average) for two consecutive five-year plan periods.

Main Lessons from Indonesian Experience

It must be stressed that increasing rice production was only part of the story of self-sufficiency and rising rice consumption. The role of prices and price stability was also important in allowing consumers to maintain a smooth trend in rice consumption even though production varied considerably from year to year.

A key element of government involvement in reaching self-sufficiency is through the level of rice prices maintained in the domestic economy. Other things equal, a higher level of rice prices will increase rice production, decrease rice consumption and make self-sufficiency easier to achieve. It has often been said that Indonesia can always be self-sufficient in rice at some price; the issue is whether consumers can maintain satisfactory levels of rice consumption as well. But domestic rice prices do not exist in a vacuum. In particular, their level relative to the trend of prices in the world market and relative to the costs of inputs to farmers (especially fertilizer prices) strongly influences the efficiency with which consumers and producers allocate the scarce economic resources of the society.

Stabilization itself is also an element in domestic production and its contribution to food security. The short-run policy issue is the level of BULOG stocks considered appropriate for maintaining stable rice prices. With infinite stocks, prices can be kept completely stable, but both economic theory and experience dictate that a finite stock level cannot defend price stability under all circumstances.^[95] Accordingly, an

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[95] See Williams and Wright (1991) for a sophisticated analysis of the limits to price stabilization with finite stocks.

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important trade-off exists. Larger buffer stocks permit a longer period of stable prices, but at costs that rise exponentially with the size of the buffer stock. Smaller stocks require that prices fluctuate more, but with substantial cost savings. The only escape from this apparent dilemma is to add a degree of freedom to the system by permitting supplies to move into or out of the country as an additional balance wheel, once stocks are drawn down or warehouses filled up. As noted, a rigid definition of "self-sufficiency" removed the operational role for imports for a number of years.

Three elements of government policy interact to create the economic environment for self-sufficiency in rice, and its subsequent role in food security: (1) public investments in rice production to maintain it on the trend of rice consumption – mostly in rice research and extension, irrigation facilities and rural roads; (2) the establishment of a domestic level of rice (and fertilizer) prices that reflects their long-run opportunity costs in world markets – a substantial, market-wide fertilizer subsidy in the mid-1980s was a major factor in boosting rice production to self-sufficiency and the debate over fertilizer subsidies continues even today; and (3) stabilization of domestic rice prices through market interventions using buffer stocks as a balance wheel – and imports when politically feasible. Each of these elements has powerful efficiency effects individually, as well as direct impact on the state budget, and these effects make each component a separate, important policy issue. But the interconnections among the three elements make it impossible to set policy for one without having a substantial impact on the others. Consistency among all three elements is essential in the long run if substantial resources are not to be wasted. Achieving this consistency is clearly the most difficult aspect of designing a policy to assure food security at the macro level.

The New Policy Debate: Price Stability at what Price?

Price stabilization has remained an important policy objective during surpluses and deficits, but the financial costs,^[96] feasible levels of prices, and general policy thrust with respect to the agricultural sector are sharply different when the rice economy is in surplus and the main political problem is maintaining the floor price for rice farmers, and when it is in deficit and urban prices are rising. Because of the high costs of storing rice in the tropics, the finite size of stocks, and the sharply limited role for imports for political reasons, wider margins between the floor price and ceiling price have become a de facto balance wheel as well, but these wider margins call in question the implicit assumption that food security and price stability are synonymous.

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[96] Relatively little is known publically about the financial costs of BULOG's activities to stabilize rice prices. The best estimate is for 1991, a year when BULOG was actively managing the price stabilization effort solely on the basis of its domestic buffer stock. For that year, the full financial costs of BULOG's rice activities were \$233 million, which amounted to 0.11 percent of total GDP, and about 1.2 percent of the National Budget. See Pearson (1993) for more details.

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A policy approach that favors greater flexibility in the agricultural economy, and greater price fluctuations to encourage farmers and consumers to be more flexible, would seem to be an appropriate response to such widely divergent environments. But carried very far, such flexibility is not compatible with continued emphasis on price stabilization. Consequently, the policy debate since the mid-1990s over food security and price stability has required a broad perspective, one that encompasses the contribution of agriculture to the development process and analysis of the price policies appropriate to stimulating that contribution.

Indeed, with Indonesia now a member of the G-20 and chair of ASEAN in 2011, the domestic policy debate has broadened to consider the role of regional cooperation in managing rice price volatility. A more stable and reliable world rice market would almost certainly allow Indonesia to use rice imports much more extensively to help BULOG stabilize the domestic rice economy more effectively, and save significant resources at the same time.

C.Peter Timmer

Communication based on Timmer (1995c).

Can Asian successes with green revolutions be transposed to sub-Saharan Africa? This is today's big question. The few examples we have in this region of the world (particularly Malawi and Zambia) are too recent and too ambiguous for us to determine whether they are really successful or not (see box 14 on Zambia). But, whatever the specific experience of these two countries, in Africa like elsewhere, price stabilization is a necessary condition for stimulating investment in agriculture and paving the way to green revolutions.

Box 14 *Stabilizing the price of maize and green revolution: ambiguities of the Zambian "miracle"*

The price of maize is a sensitive topic that has guided Zambian agricultural and food policies since the early 20th century.^[97] This price has been regulated through border and trade measures, even during the so-called "liberalization" period. These policies have recently been intensified: firstly in 2003 when the inputs subsidy program was expanded; then from 2005 with a tightening of border controls (import and export license, and customs tariffs) and reconversion of emergency reserves into buffer stock (accompanied by a jump in volumes purchased). Today, the government provides some 400,000 producers with subsidized inputs, and purchases nearly one third of all maize produced in the country (through 620 purchasing centers), and this at a higher price than in force on the market (Govere et al, 2008; Chapoto and Jayne, 2009; Chapoto and Weber, 2009; Dorosh et al, 2009; Tembo et al, 2009; Tschirley and Jayne, 2010).

Since 2005, price volatility has greatly decreased: the coefficient of variation for the price of wholesale maize fell from 35% in the period between 1991 and 2004 to 24% in the period between 2005 and 2009.

Figure 17

Wholesale real prices for maize in Lusaka (in ZMK/kg)



Source: Agricultural Marketing Information Centre (AMIC).

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[97] The results presented in this box stem from a study on the price stabilization policies of 14 countries (Gérard et al, 2012). This work was financed by the *Groupe interministériel sur la sécurité alimentaire* (France) and was entrusted to the *Groupe de recherche et d'échange sur la régulation des marchés agricoles* (GREMA). Special thanks go to Thom Jayne for providing data on the Zambian case and for devoting time to discussions on our interpretations. He of course is not responsible for the views we express.

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Even more spectacularly, domestic maize production rocketed to the point of generating a surplus of more than 1,000,000 tonnes in 2010 (ZNFU, 2010). Average annual growth in maize production increased from 2% between 1994 and 2004 to 26% between 2005 and 2010.

Figure 18

Maize production in Zambia (in tonnes)



Source: FAOSTAT.

Should this decrease in price instability and the massive increase in production be viewed as stemming from the intensification of interventionist policies since 2005? If so, then Zambia is one of the first countries in sub-Saharan Africa that has managed to reproduce successfully the model implemented a few decades ago in Asia. It is too early to say. Other factors have also had an impact, including particularly favorable climatic conditions in recent years.

Also, has this growth in production benefited all 1.5 million maize producers? Or is it due above all to the 1400 largest? In Zambia, only a quarter of all maize producers are net sellers, and 2% of producers supply more than half the surplus sold (Weber, 2010).

Finally, questions also arise regarding the sustainability of the policies implemented since 2005 to stabilize maize prices as they alone absorb 8% of the nation's budget and 50 to 60% of its agricultural budget.

E. Maître d'Hôtel

Let us now consider the second hypothesis. Some experts believe that C-instruments are in actual fact an obstacle to the development of A-instruments. *The conventional version of this hypothesis considers that public stocks generate a crowding out effect on private stocks.* The idea is that when efforts are made to build up public stocks, private actors reduce their stocks. The reason given is that if prices rise, the State will sell part of its stock and producers and traders will find it difficult to sell large quantities. They therefore decide to stock less. Overall, public stocks simply crowd out private stocks (Newbery and Stiglitz, 1981). This hypothesis assumes implicitly that private storage and public storage have a similar effect on prices. But this is not the case. Private stocks are gradually brought to market as prices rise. Conversely, public stocks (if well managed) are brought to market only when the price exceeds a certain ceiling. This means that private stocks depress prices whereas public stocks do not (as long as the price remains below the ceiling). In certain situations, the difference between private storage and public storage is even more marked. This is particularly the case when speculative bubbles or panics occur. In these situations, private actors hoard their stocks, which can cause famines (Sen, 1977; Ravallion, 1987). These stocks are thus of no utility whereas public stocks can be used to bring prices back to acceptable levels. This clearly demonstrates that there is no equivalence between public and private stocks. Building up public stocks is therefore fully justified. And also, if the ceiling price is set sufficiently high, the crowding out effect on private stocks will be weak.

There is also another version of the crowding out effect that is both broader and more subtle. *Broader* because it considers that the crowding out effect does not arise only from public stocks but potentially from all C-instruments, and even D-instruments. Broader also because it considers that the crowding out effect does not affect only private stocks but a large number of A-instruments. Finally, broader because it considers not only short-term crowding out effects (such as reductions in private stocks) but also long-term effects on the development of A-instruments (such as impeding the development of warehouse receipt systems). This version is also *more subtle* as it considers that the crowding out effect does not stem so much from the nature of C-instruments as from their governance. According to this approach, it is when public interventions are unpredictable that they give rise to an additional source of uncertainty for market actors and a crowding out effect on private storage and private imports (Jayne and Jones, 1997; Jayne *et al.*, 2006; Jayne *et al.*, 2008; Chapoto and Jayne, 2009; Tschirley and Jayne, 2010; Abbink *et al.* 2011). This is what has happened in a number of eastern and southern African countries over the last 15 years (see box 15).

Box 15 *Are maize prices more stable in countries with stabilization policies?
Evidence from eastern and southern Africa*

There is continuing debate in Africa about the appropriate roles of the state and the private sector in staple food markets. At the center of this debate is the perception that food prices have become more unstable in countries that have liberalized their staple food markets, thereby exacerbating the plight of poor consumers and farmers. Unfortunately, there remains a dearth of empirical evidence comparing the degree of price stability and predictability achieved through the implementation of state marketing and trade policies vs. a relatively liberalized and open borders policy. Assessments of this issue are complicated by the fact that neither state-led nor liberalized food policies are monolithic in their design or implementation. Impacts of policies on price instability may depend on variations in both design and implementation. Nevertheless, it would be useful to compare the magnitude of food price instability in countries that have embraced relatively comprehensive staple food market reform policies over time versus those in which the state continues to influence and stabilize food prices through the operations of marketing boards and controls on trade.

Our study examines the amplitude of price instability and unpredictability between countries in eastern and southern Africa using trade barriers and marketing board operations to stabilize prices versus countries with relatively open trade policies. *Instability* is defined as the unconditional variance in food prices over time, whereas *unpredictability* is defined as the unanticipated component of price instability, i.e., the conditional variance from a price forecasting model. Our analysis covers a period in which data was consistently available across all countries, January 1994 to December 2008.

Two groupings of countries in the region are defined according to their maize marketing and trade policies. The first group of countries (*Category A*) is comprised of those having adopted staple food market liberalization in a relatively comprehensive and sustained manner, with the role of government being limited mostly to regulating the playing field, investing in physical infrastructure, encouraging diversification of food consumption patterns, improving rural financial markets to improve traders' capacity to absorb surplus production, and relying primarily on private trade to stabilize maize prices. The second group of countries (*Category B*) includes those having implemented a more partial liberalization process, in which the private sector is encouraged to operate but where governments also continue to operate extensively in food markets, mainly through marketing board activities and discretionary trade policy tools such as export bans, changes in import tariff rates, and direct government importation and

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stock release. Mozambique and Uganda best fit the first category (A), whilst Zambia, Malawi, Ethiopia, and Tanzania fit the second category (B). Kenya's position has shifted over time, being a *Category B* country until January 2005, when it harmonized its import tariff rates with neighboring east African countries (from as high as 50% down to 2.75%). This rate has not fluctuated from that time until late 2008 and over this 45-month period Kenya essentially embraced an open borders policy with respect to regional trade.

These contrasting approaches to food price stabilization in the two groups of countries can provide useful information for policy makers and development planners to improve the performance of staple food markets. Our focus is on the class of discretionary and, therefore, not easily anticipated trade policy interventions as commonly implemented in many countries of eastern and southern Africa. We hypothesize that an unpredictable trade and marketing policy environment will depress trader activity that could otherwise stabilize prices through spatial and temporal arbitrage.

The selection of countries included in this study is mainly based on the availability of country time series data for carrying out the analysis. Because there is great heterogeneity within both country categories that could influence price instability apart from differences in marketing policy environment, our analysis controls to the extent possible for other exogenous influences.

The study highlights several findings as follows:

First, with the exception of Malawi, none of the other Category B countries pursuing food price stabilization policies and food security objectives through direct state operations over the study period has been able to match production growth for Sub-Saharan Africa as a whole. By contrast, Mozambique and Uganda, countries that have maintained relatively stable maize marketing and trade policies have experienced more than a 100% increase in maize production over the past two decades. However, in the past two years since 2008, the end year of our analysis, Zambia has achieved a major increase in maize production, due to a combination of unusually favorable weather, high maize price supports for farmers of roughly \$275 per ton, and large-scale input subsidy programs in 2009 and 2010.

Second, Malawi and Zambia have the highest degree of price volatility and price uncertainty compared to all the other countries. The measures of price uncertainty control for other factors affecting prices such as rainfall, seasonal effects, and exchange rate movements. This finding suggests that the highly discretionary trade and marketing policies in these two countries have had a destabilizing effect on prices and market predictability over the 1994-2008 sample period, although the counterfactual of little or no government intervention in food markets is not known because there is

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no period of time when these countries pursued such policies. In the past two years since 2008, a combination of factors have contributed to price stability in both Zambia and Malawi, and it would be useful to update our analysis to estimate the role of state policies in contributing to the relatively stable prices in 2009 and 2010.

Third, Mozambique, a country that has pursued a relatively open trade and marketing policy in southern Africa, has the lowest price variability in the capital city of Maputo, but the other markets for which data was available, Nampula and Beira, have price volatility and market uncertainty closer to that of Malawi. Other evidence cited in the report demonstrates that markets in the northern part of Mozambique are somewhat integrated by trade with markets in Malawi; hence policy instability in Malawi is likely to be transmitted into these markets.

Fourth, historical unconditional and conditional Coefficient of Variations (CVs) have declined greatly in Kenya since Kenya's entry into the East African Commission trading agreement in January 2005. The more stable trade policy environment between 2005 and 2008 appears to have contributed to the decline of both price volatility and market uncertainty.

Fifth, there is no apparent difference between coastal and landlocked countries in terms of the magnitude of price instability and unpredictability measures.

Sixth, in well functioning markets, there is a regular seasonal price pattern in which prices are lowest directly after the harvest, and rise gradually over the season reflecting the costs of storage until they reach their peak in the months prior to the next harvest. This pattern is seen most clearly in Randfontein, South Africa. In other countries, deviations from the normal seasonal pattern of maize prices are particularly pronounced in years of discretionary government involvement in trade and stock releases.

These findings indicate that many governments' well-meaning attempts to stabilize prices may actually destabilize them. Future food prices appear to be more difficult to predict in an environment in which the extent and composition of marketing board operations are frequently changing and where cross-border trade policies also change in ways that are difficult to anticipate. There is increasing evidence of strategic interaction between the public and private sectors in food markets. Private trade and investment develops more slowly and more tentatively in countries where government policy is particularly unpredictable. While private trading systems will always result in price variation – potentially very wide price swings in landlocked countries with poor transport infrastructure – they tend not to cause the frequent food crises due to policy mistakes and inaction that are commonly seen in the region. However, these findings do not suggest that governments have no role to play in maize markets. The findings rather indicate that the price instability and unpredictability could be mitigated

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more effectively by making the state's role more predictable. Predictability can be enhanced by adopting a rules-based and transparent approach to state operations in markets so that the private sector understands the specific market conditions that will trigger government interventions. Other positive roles of government to manage price instability includes: regulating the playing field, investing in physical infrastructure, encouraging diversification of food consumption patterns, improving rural financial markets to improve traders' capacity to absorb surplus production, and encouraging the development of regional maize trade and market-based risk management instruments to manage maize prices.

A. Chapoto and T.S. Jayne

Communication based on Chapoto and Jayne (2009)

<http://www.aec.msu.edu/fs2/papers/idwp102.pdf>

Who is right in this controversy? Does recourse to C-instruments stimulate or inhibit the development and use of A-instruments? Both hypotheses are supported by solid empirical evidences. In fact, if we look closer, *the two are not incompatible*. When stabilization policies are successful, *i.e.* when they effectively prevent prices from reaching extreme values, they have a beneficial effect on the development of A-instruments (as occurred in Indonesia). Conversely, when recourse to C-instruments results in increased price instability (as occurred in a number of eastern and southern African countries), they contribute to increasing the price risk and discouraging producer, processor and trader investment and storage. The key to success therefore lies in the governance of C-instruments: interventions must be triggered only when prices move outside a band that is defined in advance and is known to all; and the floor price and ceiling price that trigger interventions must be set at realistic levels (1.5.3). If these conditions are met, then recourse to C-instrument results in more stable and more predictable prices, and this in turn greatly stimulates investment in A-instruments. It should also be recalled that non-intervention is not a credible strategy: all know that the State will intervene if prices rise too substantially. It is therefore better to know when the State will intervene (ceiling price) and how (instruments and the manner of their implementation). A well managed stabilization policy is therefore the best option we have for stimulating the development of A-instruments.

In efforts to improve the governance of price stabilization policies, certain States have set up forums with private actors (see box 16 on the multi-stakeholder platform set up in Madagascar for rice).

Box 16

*Improving the governance of stabilization policies
by setting up forums with private actors:
the case of rice in Madagascar*

Rice plays a strategic role in Madagascar both for the income it provides (43% of agricultural Gross Domestic Product (GDP) and 12% of national GDP, see FAO/UPDR, 2000) and its role in household consumption (about 115 kg/inhabitant/year, see Carimentrand, 2011). Given the poverty of Madagascar's population, holding rice prices stable is key to food security.

It was the inadequate management of the 2004 food crisis that led to the development of a novel scheme for the governance of stabilization policies. Back in 2004, the domestic market saw an unprecedented rise in prices (+ 90% between January and December) due *i*) to a sudden depreciation of the national currency, *ii*) a rise in the international price of rice and *iii*) damage caused by two violent hurricanes. The State intervened by negotiating the purchase of 100,000 tonnes of rice from the government of Thailand and by granting special facilities to a group of importers charged with the operation, subsidizing transport and fixing distribution margins. But this operation failed to avoid a shortage: it was very late getting off the ground, was very disorganized and discouraged traders – suffering from great uncertainty – from importing (Dabat *et al.*, 2006). Because *i*) deficits and needs had been poorly estimated, *ii*) government actions lacked transparency and *iii*) actions were poorly coordinated with the private sector, State interventions even served to worsen the situation.

It was in this context that two new tools intended to help decision-making were set up in 2005, with the aim of instituting a new form of governance that would encourage the circulation of information and involve private actors. *L'Observatoire du Riz* (OdR) produces and disseminates market information both to private actors and public decision-makers. It publishes prices bulletins (every week), technical and economic reports on the rice market (several times a year) and market outlooks (often at the request of decision-makers). *La Plateforme de concertation et de pilotage de la filière riz* (PCP Riz) is made up of eight panels representing the different actors in the market chain. Its mission is to: *i*) prompt meetings, dialog and information sharing between private actors and between them and the State, and *ii*) submit proposals to the government concerning rice policies in general and rice price stabilization policies in particular. The Platform builds on information provided by the OdR.

As these two schemes have been operating for five years, their contribution to and limitations in the design of public policies can now be evaluated. The rice market faced three crises during this period. From February to April 2007, hurricanes caused major damage to transport and production infrastructure in certain regions. Close

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market monitoring and consultations between the State, donors and the OdR meant that suitable measures could be taken (trade restrictions were lifted and targeted emergency aid was provided). As a result, the price rise was limited both in space and time. When international prices soared in 2007-2008 the scheme provided a better estimate of needs and greater transparency with regard to public interventions (negotiation with India of the purchase of 50,000 tonnes of rice at preferential prices, exemption from VAT, seed and fertilizer subsidies for off-season production). As a result, importers knew that prices would rise: therefore, they placed their orders early, and no speculation occurred. The rise in international prices therefore was not felt on internal markets. Finally, in 2009, amid a political crisis that was sweeping the country, the government set up the distribution of 50% subsidized rice whereas the harvest was at its height. The PCP intervened, asking for this operation to be halted, and this reduced the duration of these distributions and their depressive effect on the price of local rice. Altogether, since 2005, the market has not witnessed any major upsets despite a disturbed international and national context.

Although it can be stated that the OdR undeniably improved the accuracy of information provided to decision-makers concerning the state of the national market, the actual degree to which PCP weighs on public decisions is more difficult to establish, although it has undoubtedly initiated a change in policy making. The scheme's main limitation is its purely consultative role: in periods of crisis, short-term political goals easily outweigh advice from PCP. Another limitation is that PCP members do not all have the same economic power and skills, and this in particular penalizes producers.

H. David-Benz.

C-instruments and B-instruments: complementary instruments

C-instruments are also criticized for generating a crowding out effect on B-instruments. Provision by the State of free protection against instability is alleged to discourage recourse to private price risk hedging instrument. True, the argument has some degree of pertinence in developed countries. For instance, ever since CAP reform brought an end to price stabilization within the European Union, Europe's grain producers have greatly increased their use of futures markets. But this argument does not hold for DCs given that *i*) B-instruments in these countries are underdeveloped (even in the absence of public intervention) and *ii*) producers in these countries have little access to B-instruments. *The argument tends to suggest that C-instruments and B-instruments are complementary. The first are relevant for DCs whereas the second are suitable for developed countries.*

Another form of complementarity between B-instruments and C-instruments lies in the use of B-instruments by governments as a means to avoid passing on instability to State budgets. This stems from the problem that the use of C-instruments leads to public expenditure that is both irregular and unpredictable given that stabilizing interventions are triggered by changes in price. Price stabilization in this case means that the instability is passed on to State budgets. States can nevertheless turn to B-instruments in order to stabilize the cost of stabilization policies. Thus, if a particular State is aware that it will have to intervene if domestic harvests are poor, it can take out weather insurance. Another State which fears that international prices will soar can acquire a call option. If its fear materializes, the State will intervene but the cost of its intervention will be buffered (in the first case the State will receive a payment from the insurance company; in the second case it will obtain supplies at a moderate price by exercising the option).

C-instruments and D-instruments: competitors but complementary

As both C-instruments and D-instruments are based on public interventions, they are in competition for budget resources. The approach with C-instruments involves buying and selling at the market price in order to inject or withdraw the largest quantity possible with a given budget (or to minimize the cost of an intervention that involves a given quantity). The approach with D-instruments leads to a smaller quantity being either distributed for free or sold at a subsidized price (generally targeting vulnerable populations). Therefore, the two approaches are in part contradictory. For any given budget, the State can either choose to have a maximum effect on market prices, or a maximum effect on the price received or paid by targeted groups. The tension between these two approaches can be clearly illustrated by the Ethiopian government's policy in 2008 in response to soaring prices (see box 17).

Box 17 *Stabilizing Wheat Prices in Ethiopia: Subsidies, Rents and the Cost of Market Interventions*

Context. Due in large part to substantial variations in altitude and rainfall across the country, Ethiopia produces a wide range of cereals, each accounting for less than 30 percent of national cereal production. Maize (27 percent of cereal production in 2008/09), teff (21 percent), sorghum (19 percent) and wheat (18 percent) are each a major staple in part of the country. Since there is little international trade apart from wheat imports (both food aid and commercial imports), however, consumption shares of cereals are almost identical to their production shares except for wheat (22 percent of total cereal consumption).

In spite of remarkable growth in Ethiopia's agricultural production from 2004/05 to 2008/09, prices of major cereals (teff, maize, wheat and sorghum) fluctuated sharply in both nominal and real terms. Much of the increase in nominal cereal price was associated with overall macro-economic inflation which reached over 50 percent (on a year-to-year basis) in mid-2008, making stabilization of food prices a high priority for the Ethiopian government. The rise in international wheat prices was not a major factor in movements of domestic wheat prices in 2007 and early 2008, however, because food aid imports kept domestic prices significantly below import parity. Later, when macro-economic inflation helped push up domestic wheat prices in late 2008 and 2009 to levels above import parity prices, foreign exchange rate rationing prevented private sector imports and direct transmission of international prices to domestic markets (Figure 1).

Policy implemented. In mid-2008, in an effort to lower domestic wheat prices, the government intervened in domestic markets by importing wheat on a commercial basis and then selling 283 thousand tons of the wheat at fixed subsidized prices (generally 300 Birr/quintal, only about half of the wholesale price of wheat in Addis Ababa market). Most of this wheat (55 percent) was sold to flour mills; 23 percent of the subsidized wheat was sold to consumers through selected urban shops and 18 percent of the wheat was sold to rural village-level consumer cooperatives. Overall, less than 2 percent of the wheat (8,100 tons) was sold to wholesale traders, and none after September 2008, due to concerns that traders did not pass on the huge implicit subsidy to consumers.

Effectiveness. Sales of government imported wheat reduced real wheat prices in domestic markets from July through October. Average wheat consumption per month was estimated about 192 thousand tons per month, equal to about 770 thousand tons total over the four month period of July to October, 2008. Announcement of planned imports of 157,500 tons of wheat and disbursements to millers and wholesale traders contributed to a 12 percent fall in wholesale wheat prices in Addis in July 2008

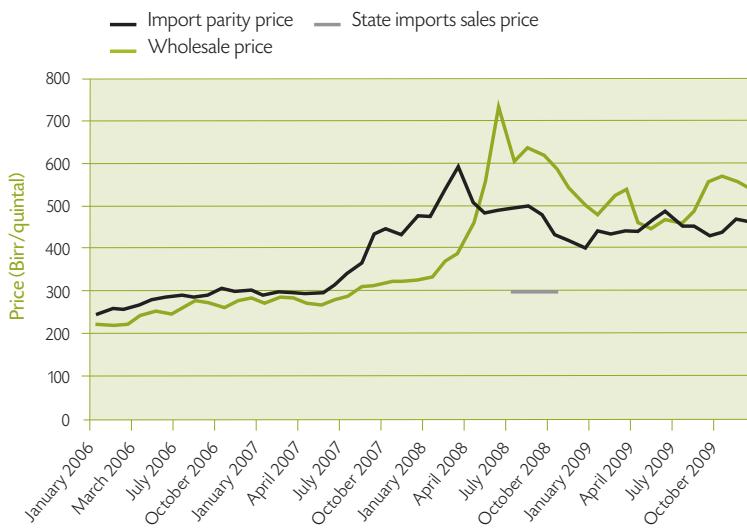
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relative to the June 2008 price (24 percent in real terms). Wheat prices rose slightly in real terms in August, but nonetheless averaged about 20 percent below June 2008 real price levels from August through October 2008. October 2008 real prices were 26 percent below a projected real price without the import intervention (the June price plus an estimated 2 percent per month real seasonal price rise).

Figure 19

*Price of wheat in Addis Abeba in Birr/quintal (2006-2009):
wholesale price, import parity price and State imports
sales price*



Source: Dorosh and Ahmed (2009).

These reductions in food prices are somewhat less than a simulated 34 percent decrease using an elasticity of wheat demand with respect to wheat price of -0.8 (a level approximately equal to econometric estimates using cross-section household level data). Two factors likely accounted for the smaller than expected real price decline. First, wheat millers may not have milled all the wheat received or sold all the

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wheat flour produced by October 2008. Second, imported wheat is not a perfect substitute for locally produced wheat, so increases in imported wheat quantities would likely have smaller effects on prices of locally produced wheat than on prices of domestic sales of imported wheat.

Cost. These sales at the low official price also implied huge rents (excess profits) for traders and millers who were able to purchase wheat at 300 Birr/quintal and sizeable income transfer to poor households who were able to purchase government wheat directly. The total value of these rents and subsidies (which accrued to various actors according to their share in total subsidized wheat distribution) reached about 900 million Birr (about US\$90 million).

Table 8 *Ethiopia: Subsidy on Government Wheat Sales, August-October, 2008*

	Quantity Sold (1000 tons)	Sales Price (Birr/ton)	Market Price (Birr/ton)	Subsidy (Birr/ton)	Total Subsidy (mn Birr)	Total Subsidy (mn \$)
August	94.8	3,000	6,600	3,600	341	34.3
September	121.5	3,000	6,375	3,375	410	40.5
October	66.4	3,000	5,375	2,375	158	15.5
Total /Average	282.7	3,000	6,215	3,215	909	90.4

Source: Dorosh and Ahmed (2009).

Policy Alternatives. One alternative to this policy would have been to auction government wheat imports in domestic markets. Such a policy would eliminate rents accruing to recipients of subsidized wheat. It would also have generated additional government revenue (through sales at a higher price), while having essentially the same effect on market prices as government subsidized sales, since the volume of wheat injections into the Ethiopian wheat market would have been the same.

Another policy alternative would have been to promote private sector imports. As of March 2008, foreign exchange for imports was rationed, effectively stopping private sector wheat imports. Domestic wheat prices rose above wheat import parity prices after May 2008, indicating that it would be profitable for private traders to import wheat if they had access to foreign exchange at the official exchange rate. As a result,

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import parity did not provide a ceiling on domestic prices of wheat. Instead, domestic wheat prices rose above world prices beginning in May 2008, reflecting the inability or unwillingness of private importers to take advantage of the profitable trade opportunity. Factors such as lack of access to foreign exchange, policy uncertainty related to government imports and domestic sales, and concern over possible seizure of private stocks all likely contributed to this lack of private sector import supply response. Although government imports and sales reduced market prices from extremely high June 2008 levels, market prices still averaged 36 percent above import parity prices from July to October, 2008. Inhibiting private sector imports through foreign exchange rationing thus resulted in lower wheat imports, higher wheat prices, lower wheat consumption, and reduced welfare for net wheat consumers.

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Communication based on Dorosh and Ahmed (2009)

<http://www.ifpri.org/sites/default/files/publications/esspdp04.pdf>

But relations between C-instruments and D-instruments are not restricted to this competition for budget resources. The two instrument categories are also complementary insofar that C-instruments facilitate the work of D-instruments: by preventing prices from soaring too high, C-instruments reduce the number of households that need D-instruments, both in the short run (price shocks are less violent) and in the medium run (household decapitalization is slowed).

2.3.5. *Obstacles hindering the use of C-instruments*

Various factors may prevent developing countries from using C-instruments.

The first of these factors is the **State's capacity to implement these instruments**, with the main obstacle of course being their cost. This can be a major problem for States with very limited budgetary resources. Another problem is whether the State has the means to govern these instruments effectively (infrastructure, qualified personnel, databases, information systems, etc.). An emblematic example of this type of problem is when a State has difficulty controlling its borders, as is the case for land borders in many African countries that are particularly porous because of smuggling activities and corruption. Evasion of the grain export bans decided by many West African countries during the 2007-2008 clearly illustrates this porosity (Staatz *et al.*, 2008). Moreover, because of re-export trade, land border porosity may lead to some degree of porosity in borders with the international market. A famous example of this is Benin that for many years re-exported rice to Nigeria during the period that

it prohibited or heavily taxed rice imports (Galtier and Tassou, 1998). A regional policy (or at least the coordination of national policies) could solve this problem.

The feasibility of C-instruments may also be limited by **factors related to the characteristics of the goods (perishability, tradability)**. For example, if the product whose price we are seeking to stabilize is perishable, it is impossible (or very costly) to build up public stocks. Likewise, it is impossible to use border measures if the product is not tradable. These limitations can generally be overcome, but only at a high cost. For instance, it is sometimes possible to stock perishable or fragile goods, but this requires considerable resources (phytosanitary treatments, refrigerated systems, etc.). Similarly, the price of a non-tradable good can be stabilized by applying border measures on a tradable product with which it is substitutable. For instance, in Sahel countries, the price of (non-tradable) millet can be stabilized by varying the tariffs placed on rice imports. These technical limits can nevertheless constitute major obstacles to price stabilization. For example, a major proportion of the caloric intake in some African countries is provided by perishable, non-tradable products that are poorly substitutable with tradable goods (cassava, yam, plantain). This makes C-instruments powerless given that neither public storage nor border measures can be implemented. The medium-term solution therefore lies with A-instruments for some of these instruments can to a certain extent render these products storable or tradable. For example, cassava can be stored if milled into flour. Likewise, the development of warehouse receipt systems improves product tradability. Thus, A-instruments can boost the effectiveness of C-instruments.

A third series of limitations concerns **instrument compatibility with the country's international commitments, particularly with WTO rules** (but also the country's participation in custom unions or free-trade areas). WTO rules usually restrict "internal support measures" such as input subsidies and the use of public stocks (see box 18). These rules, however, are applied with considerable flexibility in developing countries. For instance, input subsidies are tolerated if they concern producers who "have low incomes or possess limited resources". And public stocks are accepted if "their purpose is food security" and if "buying and selling occurs at current market prices". And regarding "border control measures" (taxes, subsidies and quantitative restrictions), WTO rules are asymmetrical. Although countries have the right to take measures that place them at a disadvantage in international competition (e.g. import subsidies or export restrictions), measures that place them at an advantage, e.g. import tariffs or export subsidies, are tightly regulated. For instance, all export subsidies must in principle be reduced then disappear in 2013. Import quotas are prohibited. Only fixed tariffs are tolerated on condition *i*) that they remain below ceilings determined

in 1994 ("consolidated levels"), or *ii*) the country finds itself in the situation described by the special safeguard clause. The tariff may be modified on an *ad hoc* basis (so long as it remains below the consolidated level). By contrast, indexed tariffs are prohibited even if the highest tariff band is below the consolidated level (see the decision concerning the dispute between Argentina and Chile). All these rules could come in for review if Doha round negotiations are restarted and a new agricultural agreement is reached.

Box

18

What restrictions does WTO impose on public price stabilizing instruments?

WTO rules for agricultural products are mainly formulated in the agreement called "GATT 1994" (which itself reproduces a large proportion of the text in the General Agreement on Tariffs and Trade [GATT] 1947) and in the Agricultural Agreement. These documents describe the general principles and the exceptions that may concern countries, products and exceptional situations. WTO imposes many restrictions on C-instruments, particularly those that may support local production: *internal support measures* that include both input subsidies and the use of public stocks, and *border control measures* (both tariffs and quotas on imports and subsidies for exports).

Internal support measures are accepted ("green box") only if they are decoupled (since they are in this case assumed to have a minimal impact on production volume). Otherwise, a ceiling is set on these measures (fixed at less than 5% of production for developed countries and less than 10% for DCs) and they are subject to reduction ("orange box"). However, investment subsidies and agricultural input subsidies are tolerated if they concern producers who "in member developing countries have low incomes or possess limited resources". Production subsidy instruments used by developing countries are therefore compatible with WTO rules on condition that they do not concern large farms. This means that production subsidies need to be targeted in certain countries that include large land owners. Likewise, public stocks are accepted if their purpose is food security, if their management is transparent, and if buying and selling occurs at current market prices.

Regarding *border control measures*, the general principle is that quantitative measures are prohibited (they must be converted into tariffs), as are indexed taxes and subsidies.

Nevertheless, the prohibition on quantitative measures – quotas, licenses, bans – does not apply to the export of food products (see article 11 of Gatt 1994 and article 12 of the Agricultural Agreement). The decisions taken by many countries in 2007-2008 to ban grain exports did not therefore breach WTO rules.

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Only fixed rate taxes and subsidies are tolerated. In addition, taxes on imports and subsidies for exports must comply with a ceiling, and must be reduced over time. The most drastic measure concerns export subsidies: these have to decrease then disappear in 2013 (the only point agreed upon in 2005). Regarding taxes on imports, rate ceilings ("consolidated levels") were determined in 1994 (on the basis of past levels for developed countries, whereas DCs obtained the right to choose their consolidated levels). However, these "consolidated" levels can no longer now be modified. They must also be reduced over time (except for Least developed countries [LDC]). An initial reduction took place before 2002: 36% reduction between 1995 and 2000 for developed countries and 24% between 1995 and 2002 for DCs (except LDCs). A further reduction in ceilings was scheduled in 2005 (the magnitude of this reduction was linked to ceiling levels at the start of the period: high, moderate or low). This measure also applies to regional trade agreements: WTO member countries may form custom unions on condition that they set a common external tariff that is less than the customs duties previously in force in the member countries of the union. As for tariffs indexed on international prices or domestic prices, these are prohibited by WTO, even if the upper bound of the band is beneath the consolidated level! Only *ad hoc* increases in tariffs are possible, on condition that: *i*) they remain beneath the ceiling defined by the consolidated level or *ii*) the country finds itself in the situation specified by the "special safeguard clause" (article 5 of the Agricultural Agreement). This clause provides for customs duties to rise temporarily above the consolidated level. This measure, however, is limited in time (one year) and is tightly confined by a system of triggering (price or volume) thresholds that are deemed to be too restrictive by countries such as India that made it a *casus belli* at the last WTO negotiation conference (July 2008) where the clause was to be revised.

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The last obstacle in the path of C-instruments is their political feasibility. For example, the producers' lobby may be opposed to selling part of public stocks, or to any reduction in import tariffs (and even more so to temporary import subsidies). The solution to this problem lies in symmetry: public interventions must protect both consumers (if prices soar) and producers (if prices collapse). This symmetry, or reciprocity, can only be guaranteed if the stabilization scheme is governed by rules that are fixed in advance and are known to all. Economic actors are more likely to accept an intervention that to them is disadvantageous if they are assured that, if the price climate swings the other way, they in turn will benefit from stabilizing interventions. Let us here in passing note that this leads to recommendations for *indexed* taxes or subsidies on imports and exports which are currently prohibited by WTO rules (only *ad hoc* tariff variations are allowed, see box 18).

2.3.6. *The advantages, limitations and perverse effects of C-instruments*

What are the advantages of using C-instruments? What effect can they be expected to have on price instability? Can public interventions based on C-instruments facilitate the emergence of other instrument categories? Or compromise their emergence? What roles do context and governance play in the performance of C-instruments? We will address these by considering the advantages, limitations and perverse effects of C-instruments.

The advantages of C-instruments

C-instruments play a vital role in price stabilization. C-instruments are the only instruments that can be mobilized in the face of imported and endogenous instability. *Let us consider first the case of imported instability.* Here, A-instruments are mainly ineffective (even though private stocks may spread over time the passing on of international instability to the domestic market). Importers and exporters may use B-instruments to hedge price risk but this generally will not stabilize domestic prices given that an importer has no interest in selling below the import parity price, even if covered against a rise in international prices. The only means to mitigate the passing on of international instability to the domestic market consists in using border measures. Likewise, *nothing compares to C-instruments in their capacity to deal with endogenous instability.* True, to reduce endogenous instability we could simply rely on free trade to reduce the parity price band.^[98] But sometimes the price needs to be

[98] But free trade increases the country's exposure to imported instability. It also deprives the government of a slice of its revenue.

stabilized below the import parity price (or above the export parity price), which is impossible through free trade. And sometimes the quantity available on the domestic market needs to be increased very rapidly in order to counter speculative bubbles and panics. In this case, it is not sufficient to rely on imports. Public stocks are necessary. *C-instruments also play a key role in countering natural instability*: even in situations of natural instability, A-instruments cannot prevent prices from soaring (even if it is assumed that markets operate perfectly, see Williams and Wright 1991). C-instruments are therefore necessary complements to A-instruments, particularly in order to protect consumers. But C-instruments can also counter natural instability through another channel: by facilitating the emergence of A-instruments.

By stabilizing prices, C-instruments stimulate investment. This in turn facilitates agricultural modernization and hence triggers the process of economic development. It is now recognized that the structural transformation of agriculture is generally a necessary step along the road to economic development (Timmer 1988; World Bank 2007; Timmer 2009a). And this is the second advantage of C-instruments (see box 13 on the Indonesian case).

Price stabilization by C-instruments is also essential to guarantee food security as C-instruments complement D-instruments and enhance their effectiveness. When a large proportion of the population slides into the red because of a price rise, it is very difficult to operate targeted transfers to a multitude of vulnerable households. In this case it is often more effective, and less costly, to intervene in order to stabilize prices. Price rises are thus reduced and this reduces the number of households in difficulty, which in turn facilitates their targeting by D-instruments. In the same manner, by reducing the amplitude and frequency of price surges, C-instruments reduce the number of households that fall into the poverty trap and this facilitates household recapitalization by D-instruments.

The limitations of C-instruments

C-instruments nonetheless have certain limitations. Firstly, *most C-instruments can only be applied to products that possess certain properties*: public stocks can be used only for non-perishable goods, border measures apply only to tradable goods, input subsidies are useful only on goods whose yields can be increased. Action can of course be taken on the price of one product by intervening on another product with which it is substitutable. For instance, in Sahel countries, the price of millet can be stabilized by varying the tariffs on rice imports. But *these crossed effects are limited by the substitutability between products, which is often only partial*. For example, when in 2005 the price of millet soared in Mali because of a poor harvest (the "locusts

crisis”), the import parity price of rice halted the rise, but only after the price of millet had doubled (Galtier *et al.*, 2010)! This problem is particularly acute for products that are: *i*) important for food security, *ii*) perishable and *iii*) non tradable. This for example is the case for cassava or plantain in certain African countries. As already mentioned, the solution here lies to a great extent in A-instruments that may to a certain degree render these food products more storable, tradable or substitutable with tradable goods.

Another important limitation of C-instruments *is their cost*. For example, public stocks need to be very large if they are to have an effect on prices, and are therefore costly. In some years, public stocks in Zambia purchased up to 30% of the country's maize production! Likewise, in 2008, the lifting of import tariffs in many countries was not enough to stabilize domestic prices. Substantial subsidies would have been needed to achieve this.

Finally, *problems of governance can sometimes compromise stabilization policies*. For example, traders may not pass on tariff reductions or subsidies. Import or export quotas may be circumnavigated if the State does not control its borders. Public stocks may in part be siphoned off by State officials.

The perverse effects of C-instruments

C-instruments may also cause perverse effects. As already mentioned, *ad hoc* (unpredictable) *interventions may discourage trade and private storage, and in this way increase price instability*. The same may happen if the price band used to trigger interventions is too narrow (hindering large-scale trade) or if the ceiling price is not sufficiently high to cover production and storage costs. The effect is even more disastrous if the State announces an intervention then fails to intervene (see box 15 on the maize price stabilization policies of different eastern and southern African countries). Clumsy public interventions *may in the long run block the development of A-instruments* (e.g. warehouse receipt systems). The governance of price stabilization policies can nevertheless be improved by following a few simple rules (1.5.3.). The State must establish intervention prices (floor price and ceiling price) at realistic levels. These intervention prices should be announced in advance and must be observed. Improving the governance of stabilization policies may involve setting up forums with private actors (see box 16 on the platform set up in Madagascar for rice).

Another perverse effect of C-instruments is the budgetary instability they may cause. The cost of C-instruments is not evenly spread over time. They are particularly costly in situations of soaring prices for here the State must resort to costly interventions

(e.g. reduced taxes, subsidies or use of public stocks). Some economists have even argued that stabilization policies simply shift instability from prices to other variables, such as the State's budget. We can even go further and consider that budgetary instability may lead to policy instability (as these are dropped when the State can no longer support their financial cost). This instability can then in turn enhance price instability. As we have already seen, solutions to this problem can be found by government use of B-instruments and by the setting-up of international D-instruments targeting DCs (1.6.1.).

Also, *variable border measures have the perverse effect of exporting instability onto the international market*. This is seen for tariffs, subsidies and quotas. A famous example of grain prices being destabilized by border measures occurred when many countries banned rice exports in 2008. These measures (taken in response to soaring international prices), reduced supplies on the international market and exacerbated the price surge (Headey and Fan, 2008; Christiaensen, 2009; Headey, 2011). Mirroring this, export subsidies (set up in times of surplus) will depress international prices. The same problem is encountered in importing countries. Variable import tariffs mean that these countries' demand on the international market is rendered insensitive to price. This demand rigidity means that all adjustments are made by the supply side, and this amplifies price instability. But these destabilizing effects are different from one country to another: they are major for large countries and negligible for small countries. They are also probably more marked for exporting than for importing countries. These negative externalities prompt us to consider the role the international community should play in regulating border measures (through the WTO) and stabilizing international prices (1.6.2 and 1.6.3).

Finally, by biasing price incentives in its favor, *stabilization policies may cause excessive development of the agricultural sector*. This may take the form of an excessive growth in production (particularly if the price stabilization measures are coupled with input subsidies.^[99] Given that food consumption is rigid (increasing little when prices fall), this surplus is difficult to absorb in the domestic market. If the good is non-tradable, or if the country is landlocked, the surplus is also difficult to export. Two courses of action are then possible. Either the government at all costs defends the floor price it established, which is excessively costly,^[100] or it gives up the fight and the overpro-

[99] This is not purely hypothetical: Zambia generated a surplus of about 1,000,000 tonnes of maize in 2010.

[100] It has for instance been estimated that Zambian public maize stocks in 2010 cost 2% of GDP and 5% of the State budget (Nkonde *et al.*, 2011).

duction causes prices to collapse with the risk of causing production to fall the following year (cobweb dynamics). Moreover, if, thanks to the floor price, the agricultural sector continues to attract a large proportion of capital and labor, it may slow the development of non-agricultural rural and urban activities that play a major role in structurally transforming the economies of DCs (Timmer, 2009a). These problems appear to be caused by the inappropriate use of C-instruments, namely a floor price fixed too high (see the example of Zambia in box 14) or maintained for too long a period when no longer necessary because agriculture has already undergone its structural transformation (see the example of the European Union). The solution here is to fix the floor price at the right level then gradually reduce it in line with the modernization of the country's agriculture. It is nevertheless noteworthy that the reduction in the floor price must be undertaken gradually for although it stimulates the development of non-agricultural activities, it may also cause excessive outflows of labor from the agricultural sector. The optimal dosage must therefore be found that balances the rate at which non-agricultural activities are developing with that of labor movements to these activities. ^[101]

2.3.7. What can we achieve with C-instruments?

Should C-instruments be used? Are these much criticized instruments useful or necessary for managing the problem of food price instability in developing countries? The answer is clearly "yes". C-instruments are indispensable for the management of imported and endogenous instability (where all other instrument categories are powerless) and of great use when dealing with natural instability (where all other instrument categories are insufficient). By stabilizing prices, C-instruments make a major contribution to improving the food security of developing countries. Price stabilization by C-instruments also stimulates green revolutions (that are obstructed if prices are too instable), and this has knock-on effects in other sectors of the economy and thus accelerates the country's development.

What can States (or Regional Economic Communities) do? They can implement effective food price stabilization policies on their internal markets. Different C-instruments are available to them for this purpose, with the most important consisting

[101] Some experts have put forward the idea that these problems can be solved by production quotas where floor prices are guaranteed for limited quantities of product. This option has a number of disadvantages: it is costly to administer and could give rise to corruption. It is more logical, simpler and more effective, to gradually reduce the floor price, particularly if the country has already accomplished its green revolution. Once the floor price is so low that it loses all economic meaning, it can simply be abolished.

of border measures and public stocks. The instruments used must be selected to match the context as their relevance depends greatly on local circumstances (country or product characteristics). Border measures are in most cases necessary and it is often pertinent for these to be supplemented by public stocks. Border measures are restricted by WTO rules, but States nevertheless do have some room for maneuver. When green revolutions are well advanced, the scheme can be lightened (floor price gradually reduced then abolished). But, the floor price must not be reduced too rapidly in order to slow the flow of labor leaving agriculture and thus facilitate its absorption by other sectors of the economy. The ceiling price, on the other hand, must be maintained for a while in order to protect consumers. It is only once the economy has developed sufficiently that the ceiling price is no longer needed since at this point, food accounts for only a small proportion of household expenditures and price instability has few consequences in terms of food security.

The governance of these instruments is vital if stabilization policies are to be successful. Good governance means realistic stabilization targets (a broad price band moving with long-term market trends) and sufficient resources being invested in the operation. Public intervention must be rule-based, predictable (measures announced), credible (the State must keep to its word) and free from collusion with private actors (if, for example, the State imposes import or export quotas, it is preferable for these quotas to be allocated by auction).

Policies that aim to stabilize domestic prices are obviously the responsibility of DC States or Regional Economic Communities, though some may find it difficult to develop or finance a pertinent and consistent stabilization policy. Support from the international community may in this case prove necessary. Also, as stabilization policies conducted by different countries may lead to the instability being exported onto international markets (particularly when based on border measures), international rules are required to restrict these destabilizing effects on international prices without preventing developing countries from stabilizing their domestic prices. Current WTO rules need to be modified in order to play this role in a satisfactory manner. For the same reason, C-instruments should be used by the international community to stabilize prices of basic food products on international markets. We will return to these questions in the book's general conclusion.

2.4. D-instruments: a vital role whose structural part must be expanded

D-instruments aim to transfer a good (food, cash, food vouchers and sometimes inputs) to certain categories of the population (persons suffering from malnutrition or vulnerable to malnutrition, e.g. young children; poor households or households living in areas considered to be "at risk"). Conventionally, D-instruments are activated only in a crisis. But certain D-instruments are being increasingly activated in a structural manner to recapitalize households that have fallen into the poverty trap. Here, the aim is to increase their resilience to shocks.

Unlike C-instruments, D-instruments enjoy a great deal of legitimacy. Virtually no-one, even the most "liberal", contests the need for public intervention when this saves lives (Hayek, 1988). In the "optimal strategy", the protection afforded to poor consumers relies *almost exclusively* on D-instruments (1.2.1).

Although the principle of using D-instruments is virtually unquestioned, many have criticized the manner in which they are implemented in practice, and a great deal has been written on the distortions and perverse effects of food aid. For instance, if aid is excessive or does not arrive at the right place at the right time, it may cause prices to collapse which is detrimental to producers and all those holding stocks. Perverse effects may also be structural: the fear that excessive food aid is about to be distributed, causing prices to collapse, can be enough to induce a crowding out effect on stocks and investment. Like for C-instruments, poorly managed D-instruments may obstruct the development and use of A-instruments. These criticisms have resulted in the emergence of codes of good practice, such as the Charter for Food Crisis Prevention and Management drawn up by the countries in the CILSS and the *Club du Sahel*. Some countries have made major efforts to improve the governance of D-instruments (see box 21 on the *Programme de Restructuration du Marché Céréalier* in Mali). Conventional instruments such as food aid have on some occasions been replaced by others that cause less distortion (such as cash transfers).

In addition to their perverse effects, it is the limitations of D-instruments that have recently been highlighted, particularly since 2005 in Sahel countries. The "Niger crisis" in particular heightened the awareness of many experts, policy-makers and donors to the huge vulnerability of many households decapitalized by successive crises. D-instruments in such cases are blamed for failing to prevent household decapitalization and the worsening of the nutritional situation of the most vulnerable.

Paradoxically, although the legitimacy of D-instruments is not in question, they are at present in "crisis" and this is an opportunity for change.

We will begin by presenting the rationale of D-instruments. We will then describe the diversity of D-instruments and the characteristics that set them apart one from another. We will then discuss the complementarity and substitutability relations between D-instruments and between these instruments and those in other categories. We will then address the question of obstacles to the use of D-instruments before outlining their advantages, limitations and perverse effects, and will conclude on the role that should be given to D-instruments in the food price instability management scheme.

2.4.1. The rationale of D-instruments

D-instruments aim to transfer goods to certain household categories (possibly with a matching contribution). The aim here is to ensure that poor households do not reduce their food consumption and production, and remain in possession of the resources required to react to future price shocks.

2.4.2. The different D-instruments

D-instruments differ by *a*) the nature of the goods transferred, *b*) the nature of the matching contribution, *c*) the targeting of beneficiaries and *d*) the structural or conjunctural character of instrument activation. The goods transferred may take the form of food or cash, more rarely food vouchers or agricultural inputs. The matching contribution (if any) may take the form of work (as in cash for work and food for work), or money (if the transferred goods are not distributed for free but subsidized, as with moderately priced sales) or the adoption of specific behaviors by recipient households (such as sending their children to school or attending family planning awareness meetings).^[102] Targeting may rely on a wide variety of methods and may be conducted on different scales: areas, population categories (e.g. children through school food programs), households or individuals (e.g. underweight children or breast-feeding women). A particularly interesting method is “self-targeting” that consists in creating conditions such that only households requiring aid actually ask for it.^[103] Finally, transfers may be structural or be activated only in a crisis (if food prices rise substantially).

[102] The *Progresa* (now *Oportunidades*) program developed by Mexico was the main source of inspiration for these conditional transfer programs. This Mexican program kicked off with 300,000 beneficiary households in 1997 and today has 5 million participants. Other conditional transfer programs have been developed in other emerging or developing countries, the most famous being *Bolsa Família* in Brazil and the *Productive Safety Net Programme* in Ethiopia.

[103] As self-targeting introduces a degree of flexibility (households in part choose the quantity of transfers they receive), this may lend certain D-instruments one of the most beneficial properties of B-instruments.

A plethora of instruments can be obtained by crossing the different modalities of these four dimensions. Some, however, may only exist theoretically, or be seldom used. Table 9 gives the main instruments used (classified according to the nature of the goods transferred and the nature of the matching contribution).

Table 9 *D-instruments taxonomy in relation to the nature of the goods transferred and the nature of the matching contribution*

		Nature of the goods transferred				
		Food	Money	Food vouchers	Inputs	Assets
Nature of the matching contribution	None	D1. Free distribution of food	D4. Cash transfers	D7. Free distribution of food vouchers	D10. Free distribution of inputs	D13. Assets transfers
	Money	D2 "Sales at a moderate price"		D8. Sales of subsidized food vouchers	D11. Sales of subsidized inputs	
	Work	D3. Food for work programs	D5. Cash for work programs	D9. Food vouchers for work	D12. Inputs for work	
	Behaviors		D6. Conditional cash transfers			D14. Conditional assets transfers

Source: author

These four dimensions are not independent. For instance, assets transfers are only used structurally (to recapitalize households). The same applies to transfers conditioned by the adoption of specific behaviors. By contrast, *food for work* and *cash for work* programs are D-instruments suitable for emergency interventions. Another example of interdependence between the dimensions is the fact that the nature of the goods transferred and the nature of the matching contribution may facilitate self-targeting. For example, if the good distributed or sold at a "moderate" price is a low-quality cereal, this will not interest households with the means to buy supplies on the market. Likewise, if the help is provided against unpleasant or poorly paid work, only households in difficulty will ask for it.

2.4.3. Complementarity and substitutability relations between D-instruments

These instruments aim to help vulnerable households maintain their production or consumption levels even when their real income (purchasing power) falls. Their effectiveness depends on the *quality of the targeting* (will all vulnerable households receive aid?), *the magnitude of the transfers, and their use by households*. Also, the effectiveness of an instrument must be balanced with its cost (what matters is efficiency). Last, but not least, any distortions caused by D-instruments (e.g. price collapses following an inflow of aid) must be taken into account.

When used alone, each D-instrument will have a hard job meeting all these performance criteria given the trade-offs between them. For example, excessively strict targeting (to reduce costs by avoiding transfers to households not in need), may result in elevated administrative costs and above all may lead to a proportion of the vulnerable population being overlooked. Mirroring this, “spreading the net as wide as possible” will result in high costs and generate distortions. Based on this, two standpoints are possible. The first consists in considering D-instruments as imperfectly substitutable one with another. Some are better than others according to certain criteria, but less good when measured using the yardstick of other criteria. From this standpoint, D-instruments should be chosen by weighing their different advantages against their disadvantages. Different authors have put forward “decision trees” intended to provide guidance when choosing D-instruments (Barrett and Maxwell, 2006; Creti and Jaspars, 2006). The second standpoint consists in constructing combinations of complementary instruments such that the disadvantages of some are compensated by the advantages of others. We will now consider these two approaches.

Choosing between imperfectly substitutable instruments

Here, the aim is to choose a D-instrument by weighing its advantages and disadvantages against those of other D-instruments. A first step is to show how the different characteristics of D-instruments affect their performance. We will consider successively the nature of the goods transferred, the nature of the matching contribution, the targeting of beneficiaries and the structural or conjunctural character of the transfer.

Transfers in kind (i.e. food products or inputs rather than cash) have certain advantages but also many disadvantages. Let us start with the advantages. First, as already mentioned, transfers in kind can contribute to self-targeting if the goods transferred are of poor quality. Second, they encourage households to use the transfers they receive

to maintain food consumption or production (true, households can always sell the food or the inputs they receive but this generates transaction costs). Third, particularly in Africa, cash transfers are often managed by men whereas food transfers are managed by women and this contributes to the food being used for family consumption. According to Rogers and Coates (2002), cash transfers, unlike food transfers, have no effect on child caloric intake! However, transfers in kind also have disadvantages. They generate additional costs (due to product distribution logistics) and above all they are liable to cause distortions (an inflow of food aid may cause prices to collapse).

Asking for a matching contribution also has advantages and disadvantages. Asking for work in return facilitates self-targeting. Asking for money in return (i.e. subsidizing instead of distributing for free) reduces costs and distortions (less difference with the market price than for free distribution), but it reduces the amount of the transfers and above all may exclude some extremely vulnerable households. Asking for a matching contribution therefore has an ambiguous effect on the extent to which vulnerable households are covered: it generates a positive effect through self-targeting but also a negative effect by excluding some poor households.

Targeting is also crucial. Different targeting methods may be used, and each has its advantages and disadvantages (see box 19). Strict targeting aims to reserve aid for those in need. It saves on costs and reduces distortions. If the savings made are added to the aid, this can increase the average amount of the transfers. But if the targeting goes too far, it generates high administrative costs and above all increases the risk of excluding households really in need. This is why various authors have criticized "the targeting obsession".

Box 19 *The advantages and disadvantages of different targeting methods*

The problem in low-income countries is not so much what is desirable, but what is feasible. Effective instrument implementation is generally conditioned by three factors: the financial capacity to fund interventions, the availability of the information required, and administrative capacity. Limited financial capacity weighs on intervention design as it forces a choice between the reach and the intensity of a given transfer. Concentrating resources on the poorest or most vulnerable is in this case the means to increase the service that can be provided with a given budget or produce a given impact at a lower cost. Another advantage of targeting is that it reduces the disturbing effect of aid on the market (particularly if aid is reserved for those that cannot access the market). Finally, aid is sometimes specifically aimed at lifting households or groups out of the poverty trap, which once again involves targeting.

It is therefore crucial to choose the right targeting method to reach the target population since this to a great extent will determine the intervention's effectiveness. Possible options include **administrative targeting** and **self-targeting**. Administrative targeting means selecting specific regions, areas or communities (**geographic targeting**) or specific households or persons (**category-based targeting**). The first type may be used by planners or project personnel, but also by the recipient community (community-based targeting). Self-targeting on the other hand does not rely on the selection of participants but on incentive measures inserted into the intervention program in order to restrict participation as much as possible to members of a target group. When these incentives are introduced by making changes to market mechanisms, we use the term **market-based targeting**.

When using administrative targeting, decisions on the eligibility of different persons or groups are taken by "project" personnel on the basis of whether or not the candidates correspond to predefined eligibility criteria. They may, for instance, include a "resources" criterion: to be eligible for the program, the household or person must possess the minimum quantity of resources required for adequate food consumption (resource indicators may be based for instance on per capita income, areas cropped and cattle hold). Such an approach therefore requires the collection and analysis of much data. It should be noted here that most forms of targeting have an administrative side, either for the definition of project areas, targeting criteria, or target groups.

Geographic targeting is a possible version of administrative targeting and is used to determine eligible beneficiaries. Interventions can be geographically targeted by region, district, municipality or community if these areas are relatively homogeneous with regard to the availability of food products, income or other vulnerability indicators. This form of targeting is based on the fact that the poor are often concentrated in

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certain regions. On the whole, the smaller the geographic unit employed, the more precise the targeting. However, the paucity of data available for small geographic units and the practical aspects of managing interventions may prevent small units from being used. Category-based targeting methods use poverty-correlated individual or family characteristics that, if possible, are easy to spot. Age and disability are frequently used indicators. In the last version, called **community-based targeting**, organizations in the community take decisions on allocating transfers in accordance with predefined criteria. In some cases, the communities may even contribute to designing these criteria. The target group, household or person is often selected by a multilevel targeting scheme: geographic targeting is employed to select large areas (regions, groups of villages), within which eligibility criteria are applied to households or persons.

Conversely, self-targeting means that a good or service is made available to all, but is designed in such a manner that only the poor will choose it. Poorly paid, unpleasant physical labor will not interest those who are not poor. Likewise, poor-quality food will find buyers only among the poor. In general, the greater the advantages, the less precise the self-targeting. Whereas other forms of targeting require human resources (and information) to decide on criteria and check eligibility, with self-targeting, the decision whether or not to take part is taken directly by the household or person concerned. This decision is based on three main factors: *a*) the cost of taking part (work, long queues, etc.), *b*) the quantity and quality of the goods and/or services transferred and *c*) the negative social image of taking part (stigmatization). Experience with past crises has led many governments to consider using self-targeting during interventions as a means to reduce budget costs and direct transfers more effectively to those most in need. Market-based targeting is a form of self-targeting where access to aid depends on the individual's choice to buy or sell specific goods and services on markets.

There are no simple rules for selecting an appropriate targeting method and the diverse natures of the contexts in which interventions take place often leads to huge differences in the method of targeting finally chosen. In general, targeting strategies must be in phase with the structural characteristics of the intervention area (roads, institutions, human resources, etc.). Likewise, although certain targeting methods go hand in hand with certain instruments, it is often necessary to combine methods in efforts to increase overall effectiveness. For instance, combining self-targeting with geographic targeting will yield a powerful, tried-and-tested targeting instrument, particularly for emergency food aid.

In an ideal world, maximum quantities would be transferred to target beneficiaries with minimal leakage, but in reality some compromises must be made, firstly between targeting precision and its cost. A second consists in arbitrating between the risk of

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allowing certain individuals, who theoretically are not eligible, to access the aid, and the risk of overlooking some of those in need. Broad targeting provides maximum effectiveness but does not optimize the cost/effectiveness ratio (efficiency). Conversely, narrow targeting increases efficiency to the detriment of effectiveness.

Limited financial capacity and the fear of distorting markets have often led to a veritable “hunt for leaks” and a “targeting obsession” in the use of aid. But, focusing only on leaks to the non-poor may lead to inadequate cover for the poor (Van de Walle, Devereux). And where poverty is widespread, targeting is largely superfluous and costly to administer.

J.-F. Sempéré

Finally, the question of *whether transfers should be structural or conjunctural* is also of major importance. Conjunctural measures are activated only when a “crisis” occurs (e.g. when food prices soar). Structural transfers are far more costly and are therefore liable to be of a lower magnitude. Their targeting can perhaps be better as not decided in an emergency but based on large-scale surveys and substantial databases.^[104] But the main advantage of structural transfers is that they can recapitalize households that have already fallen into the “poverty trap”. Also, households can anticipate structural transfers and may therefore count on them, facilitating their expectations and encouraging investment. To this extent, “structural” instruments share common features with private risk hedging B-instruments (insurance and hedging mechanisms). Finally, the effects on distortions is not the same. Conjunctural transfers cause distortions that are for the most part unpredictable. Structural transfers are regular and predictable, and play a redistributing role. However, as we will see later, both conjunctural and structural transfers are necessary (and to a large extent are complementary).

Table 10 presents a summary of all the above considerations. Each line in the table summarizes the manner by which the considered characteristic affects the performance of D-instruments. For example, a transfer in kind has beneficial effects (comparatively to a cash transfer) on the proportion of vulnerable households covered (thanks to self-targeting) and on household incentives to use the transfers received

[104] When structural transfers do exist, their targeting scheme can be used for emergency transfers (the amounts transferred are increased in periods of crisis). See for example the use of Ethiopian PSNP during the 2011 food crisis in the Horn of Africa..

to maintain its level of food consumption. By contrast, this transfer is more costly and causes greater distortions than a cash transfer.

Table 10 *The effect of the different characteristics of D-instruments on their performance*

Characteristics	Performance criteria				
	Effectiveness			Cost minimization	Distortions minimization
	Proportion of vulnerable households covered	Magnitude of transfers	Incentive to use transfers to maintain food production or consumption		
Transfers in kind (vs in cash)	+		+	-	-
Transfers with a matching contribution (vs without a matching contribution)	undetermined	-		+	+
Strict targeting (vs broad targeting)	-	+		+	+
Structural transfers (vs conjunctural)	+	-	+	-	+

Source: author.

All the advantages and disadvantages of a given instrument can be characterized by reading across the lines in this table which may therefore serve to compare different D-instruments and provide guidance when choosing the right instrument in a given context.

Table 10 can also be read in a column-based manner where the question, for example, is how to improve the proportion of vulnerable households covered (or how to reduce costs or minimize distortions). Table 10 makes it obvious that several instruments need to be used if the different performance criteria are to be met simultaneously. And this highlights the complementarity between category D instruments.

Combining D-instruments to make the most of their complementarities

Analyzing efficient combinations of D-instruments in detail would take us far too long. Not even an entire book would suffice. Here, we will simply make a few comments on the subject. Firstly, it should be noted that, on the ground, a combination of instruments is often employed in order to impact different populations or solve different problems. For example, certain instruments may aim to help poor households maintain their level of consumption whereas others may focus on helping people most at risk of malnutrition (such as young children and breast-feeding mothers). Secondly, these instruments are often employed in a certain sequence. In times of crisis, the first instruments used are the cheapest and those that cause the least distortion. The other instruments are activated only later, if the crisis worsens. For instance, during the 2004/2005 crisis in Niger, "soft" instruments were activated first (from the 2004 harvest): food for work, cash for work, free distributions for cereal banks and cattle feed banks, and moderately priced grain sales in high-risk areas. It was only when the crisis worsened that free distributions of food were organized on a large scale for 2.5 million people (see box 20).

Box 20 *Lessons learned from the 2005 food and nutrition crisis in Niger and their application in the development of public schemes for crisis prevention and management*

Like in other Sahel countries, the government of Niger in 1999 set up a national scheme for food crisis prevention and management based on shared decision-making and management between the State of Niger and its main donors: the *Dispositif national de prévention et gestion des crises alimentaires* (DNPGCA). The scheme is based on three components: an information system, a coordinating and decision-making structure, and intervention instruments.

The information it needs is provided by an early warning system (EWS) drawing from several information systems, namely agricultural surveys and market information systems for agricultural products (SIMA) and cattle (SIMB). The *Commission mixte de concertation* (CMC) along with its Select Committee (CRC) are charged with making decisions. A consultative body, the *Comité national PGCA*, is intended to associate different Niger ministries, administrations and NGOs in the decision-making process. Decisions are implemented by the *Cellule crise alimentaire* (CCA) – reporting to the Prime Minister's staff – supported by the grain marketing board (*Office des produits vivriers du Niger*, OPVN) with assistance from regional and county committees (local

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authorities and technical services). Scheme-based interventions employ a range of instruments: *i*) food for work, cash for work and cereal banks which are implemented *ex ante* (before the lean period); *ii*) the sale of "moderately priced" grain, which has become the scheme's instrument of choice because of its suitability for self-targeting (grain – retail – sales involve long queues) and its capacity to weigh on prices; *iii*) the distribution of free, emergency seed; *iv*) the distribution of zootechnic inputs; *v*) the distribution of free food, considered as a last resort. These interventions are based on the co-managed *Stock national de réserve* (SNR) and the common donors fund (FCD). The SNR is made up of a physical stock (national emergency reserve or SNS consisting of 50,000 tonnes of millet-sorghum) and a food security fund (FSA) equivalent to 60,000 tonnes of grain.

The 2005 food crisis highlighted the weaknesses of this scheme hitherto considered as particularly effective. More fundamentally, it showed how the causes of food insecurity have changed in the Sahel: the crisis did not arise from a shock in grain supplies, but from the fact that a large portion of the rural population found it difficult to access food. The living conditions of these households have been in constant decline for the last 20 years, particularly in the main grain producing region of the country. The Scheme – which closely monitored the possibility of a "supply crisis" – was unprepared for the management of a "resilience crisis".

At the end of 2004, after the harvest, EWS predictions focused on a deficit in the production of grain and fodder, but failed to anticipate price tensions and problems finding supplies on the regional market (namely in Nigeria). It did not take account of an erosion in household resilience and did not include malnutrition that in consequence was not monitored.

An emergency plan was drawn up based on the sale of moderately priced grain and mitigation actions (cereal banks and food for work based on labor-intensive infrastructure projects). But the implementation of this plan was hindered by the fact that the Scheme could not mobilize sufficient grain: firstly, the SNR was small (17,000 tonnes instead of the 50,000 tonnes planned); then requests for aid sent to donors (78,000 tonnes of grain as an initial request in December) failed to elicit a reaction given that donor attention was focused elsewhere (namely on the consequences of the tsunami in the Indian Ocean); and finally, the Scheme, like the WFP, was unable to procure supplies on the regional market because of the deficit in Nigeria (without counting the ban placed on grain exports by neighboring Sahelian countries, in contradiction with the rules of UEMOA).

Against a background of record grain prices, the alert sounded by WFP (following a nutritional survey) and the NGO MSF on the gravity of the infantile malnutrition situation caused a heated debate in Niger and drew international media attention to

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the crisis. The action taken by the Scheme was considered to be insufficient and pressure from WFP and humanitarian agencies, taken up by the media, imposed a humanitarian response based on the generalized distribution of free food. The Scheme's cohesion started to crack and WFP acted alone in supporting the switch to emergency aid against the will of other Scheme members. This resulted in a governance crisis.

Whereas the government and WFP up to June had been unsuccessful in mobilizing donors and thus procuring the financial and grain resources necessary for the Scheme's mitigation plan, this second period saw the arrival in Niger of a host of aid actors (United Nations agencies and international NGOs) and considerable financial and human resources. In a very short period the Scheme and WFP agreed on a food distribution program that was to concern 2.5 million people in the country.

In all, large-scale free food distributions and nutritional recovery operations contained the crisis and brought relief to populations in the lean period. But they failed to prevent the decapitalization and reduction in the resilience of a large number of rural households.

Useful lessons about the instruments used by the Scheme may be learned from the 2005 crisis:

- *The sale of moderately priced grain* showed that it has limitations when prices rise substantially: if the subsidy is too high, all households want to gain access to the grain and the self-targeting approach fails (which was the case when market prices soared). If the subsidy is low, grain remains out of the reach of vulnerable households.
- *Food for work operations and the supply of cereal banks* aim to improve the situation of households both in the short and medium terms. But experience has shown that the timelines inherent to setting up these actions are difficult to shorten in a severe crisis and their potential benefits in this case are out of reach.
- *Free distribution*. When other tools are insufficient, the distribution of free food becomes the only solution. This distribution is not managed by the Scheme but by humanitarian actors (WFP and international NGOs) that have the capacity to intervene rapidly with substantial resources. The decision on whether or not to distribute free food gave rise to heated discussions inside the Scheme, undermining its governance.

More generally, the crisis in Niger turned a spotlight on the strong inter-relationships between the structural and conjunctural determinants of food crises. Schemes must adapt to this paradigm change. They must modify their warning system in order to very closely monitor household resilience and changes in infantile malnutrition. They must also modulate their response. Sahelian countries are currently renewing their instruments, particularly with the introduction of projects that aim to strengthen vulnerable

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household "safety nets". But the possible broadening of crisis prevention policies to include more long-term food security determinants is still the subject of debate between donors. In Niger, most donors would prefer to see the Scheme first consolidate what it already does.

Johny Egg and Denis Michiels

Communication based on Michiels and Egg (2008)

2.4.4. Complementarity and substitutability relations between D-instruments and A-, B- and C-instruments

D-instruments and A-instruments have mainly complementary relations. Although it is true that if poorly managed, D-instruments may crowd out A-instruments (causing unexpected price falls, increasing the risk for market actors and discouraging them from building up stocks), the broad range of D-instruments includes means that can solve these perverse effects (targeting, cash aid rather than in kind, etc.). Otherwise, D-instruments show marked complementary with A-instruments by making up for their deficiencies and shortfalls. The most obvious complementarity concerns insolvent households. A-instruments cannot do much to help them and this is the main reason why D-instruments are necessary. Sometimes, a simple division of tasks is all that is required, with A-instruments dealing with solvent households and D-instruments with insolvent households. But sometimes this complementary goes even further. For instance, cash transfers help markets develop by allowing insolvent actors to use them. This in particular is the case for safety nets that provide structural transfers to recapitalize vulnerable households, thereby allowing them to sustainably reconnect with the market. Moreover, when transfers are made in kind and procurements are made locally, purchases by the State or aid agencies are also a means to support the development of A-instruments. For instance, WFP buy grain on commodity exchanges in Ethiopia and Zambia. Finally, D-instruments also have a role to play in facilitating the reconversion of people leaving agriculture when this undergoes its structural transformation (green revolution).

The relations between D-instruments and B-instruments are also mainly complementary in nature. As already mentioned, a sort of sharing of tasks is seen between these two risk hedging instrument categories (1.2.1). B-instruments are fairly unsuited to protecting consumers and the poor. They are also of little use in high-risk, non

probabilizable situations. However, a degree of intersection may be seen between the households covered by the two categories. For example, poor households may have access to microcredit. It is therefore not entirely impossible that (free) D-instruments could sometimes slow the growth of (costly) B-instruments. However, this is very much a fringe phenomenon in DCs given that *i*) B-instruments are almost nonexistent in these countries *ii*) households with access to D-instruments are almost always different from those with access to B-instruments.

Their relations with C-instruments fall more into the realm of substitutability because of the budgetary arbitrage between these two instrument categories. However, this should not mask the deep-seated complementarity that unites D-instruments and C-instruments. On the one hand, by preventing food prices from rising excessively, C-instruments can *i*) reduce the number of households needing emergency aid (thus facilitating targeted transfers through D-instruments) and *ii*) reduce household decapitalization (thus facilitating the work of safety nets aiming to increase vulnerable household resilience by providing structural transfers). On the other hand, D-instrument do what C-instruments are unable to do, such as protecting vulnerable households from moderate price rises or recapitalizing households that are already in the poverty trap.

2.4.5. *Obstacles hindering the use of D-instruments*

As D-instruments are public, their development does not run into the same problems as private A-instruments or B-instruments whose growth is dependent upon whether or not private actors take the risk of investing in their development or are willing to use them. In principle, D-instruments (like C-instruments), are dependent only upon the political will of governments.

The problem, however, is more complex. D-instruments may prove to be too expensive with respect to a State's limited budget resources. This problem is particularly acute for structural transfers (due to their cost): this is why safety nets have shown little development in DCs. This may lead to instrument undersizing (inadequate transfers or very restrictive targeting). The problem is further worsened by imperfect targeting that results in part of the transfers going to people not in need.

Another problem is the State's skills in governing D-instruments. If transfers are to be made to targeted people (while avoiding leaks and perverse effects), then adequate infrastructure, qualified personnel, information systems and databases are required. Emerging countries such as Brazil and Mexico often possess the necessary resources, but many developing countries do not.

These problems can in part be overcome by judiciously selecting the D-instruments used and the manner in which they are implemented. For instance, successful self-targeting both minimizes leaks and avoids targeting-related information and administrative problems. It thus makes a dual saving on costs. External financial assistance is nevertheless almost always necessary to support the development of D-instruments in developing countries.

2.4.6. The advantages, limitations and perverse effects of D-instruments

The advantages of D-instruments

D-instruments play a crucial role as they can achieve what no other instruments in the other categories can achieve. Firstly, they alone are able to protect insolvent consumers from food insecurity. In addition, not only can they help them face up to shocks, they can also help in a more dynamic perspective by recapitalizing households in order to increase their resilience to future shocks and lift them out of the poverty trap. To do this, D-instruments must be activated in a structural manner (not only in crisis periods). Finally, if price stabilization has allowed a green revolution to take place, then many households will be obliged to leave agriculture. D-instruments have a major role to play here by helping people during this structural mutation (namely by facilitating their connection with the labor market in rural and urban areas).

Also, when activated in a structural manner, D-instruments have predictable effects. In this case they enhance the security of poor, vulnerable households and thus play the same role as that played by B-instruments for wealthier households and enterprises. D-instruments thus admirably supplement B-instruments insofar as the two do not in general target the same users (for a more detailed analysis of the complementarity between D-instruments and B-instruments see 1.2.1.)

If well managed, D-instruments can also boost the development of A-instruments. Firstly, certain instruments (moderately priced sales, cash transfers, food vouchers), can help insolvent households reconnect with the market. Secondly, when aid is provided in kind and is purchased locally, these purchases by the State or aid agency (such as WFP) may constitute a powerful incentive for market modernization (dissemination of quality standards, development of a “culture” of compliance with contracts, increase in the use of warehouse receipt systems and commodity exchanges, etc.).

Finally, D-instruments may also intervene on another scale to support countries that find themselves in difficulties due to price instability. For example, importing countries facing soaring international prices may rapidly run short of foreign exchange reserves.

This may lead to a rationing of food imports or a fall in the exchange rate. These effects can be avoided by developing meta-D-instruments (designed for countries), e.g. the STABIMP mechanism that was mentioned above (see 1.6.1).

The limitations of D-instruments

In the “optimal strategy”, D-instruments were alone responsible for ensuring the food security of poor consumers.

The 2005 Niger crisis strikingly highlighted the limitations of D-instruments, at least in their classical role of providing emergency aid. Although food aid and other D-instruments used in periods of crisis over the last few decades have avoided famines (or reduced their magnitude), they have not managed (for example in the Sahel countries) to prevent the decapitalization of poor households that are now very vulnerable to (even small) shocks. This means that D-instruments are not enough to protect vulnerable households from food insecurity: a ceiling price (provided by C-instruments) also needs to be set. But this also means that the use of D-instruments should be expanded through a revision of the rationale behind their activation. D-instruments have a more important role to play than simply emergency aid: certain D-instruments should be used more structurally to recapitalize households. Some schemes are already doing this, such as the Productive Safety Net Programme [PSNP] in Ethiopia (Gilligan *et al.*, 2009).

Another limitation is flawed targeting. The risk here is that certain people in need will not receive the transfers provided by D-instruments. This risk can be minimized by opting for “broad” targeting. But here the risk is that costs will rise considerably (and perverse effects will be generated). The targeting must therefore be “right”, *i.e.* sufficiently strict to reduce costs and adverse effects, but not too strict so as not to run the risk of failing to cover households in difficulty (and also keep targeting costs within reasonable limits). But the “right” targeting can only be achieved if information systems and databases are available. Targeting, particularly in sub-Saharan Africa, has often been based on the concept of “high risk areas”. These areas are attentively monitored by specialized information systems: early warning systems [EWS]. The EWS gather data of different types such as grain production, grain prices, the relative price of grain and small ruminants (that often play the role of savings in kind), and dispensary attendance rates. When several indicators swing into the red, the alert is sounded. These schemes have long been considered as effective, but the 2005 Niger crisis spotlighted their limitations. Firstly, indicators mainly based on large-amplitude shocks are of limited relevance when small shocks are enough to push households into the red (because they are decapitalized). Secondly, given that

food insecurity is increasingly urban, the “high risk area” concept is less and less relevant. An alternative would be to operate targeting at the household level, but this would require large (regularly updated) databases. Some emerging countries (such as Brazil), but very few developing countries, possess such databases.

The perverse effects of D-instruments

If poorly managed, D-instruments can cause perverse effects. In particular, excessive or poorly-targeted food aid may cause prices to collapse. The simple possibility of this risk may be sufficient to discourage private storage (crowding out effect), or even obstruct the development of A-instruments.

These perverse effects have a number of causes. The problem may arise from the governance of D-instruments, for example if public decision-makers cave in to pressure from the street or lobbies, or take action based on cronyism. Flawed targeting may also cause distortions. Finally, logistic problems may further worsen the situation (for example if aid is delivered too late).

Solutions to the above lie in part in recourse to D-instruments that cause less distortion (such as cash transfers). And above all in better governance. These interventions, like for C-instruments, must be regulated by rules, and these rules must be announced in advance and must be observed. Good governance practices must be adopted both by developing countries and by donors as both in the past have failed in this area (it has happened that the quantity of food aid provided has correlated more with the stocks of donor countries than with the needs of recipient countries). These good governance practices may be expressed in charters such as the Charter for Food Crisis Prevention and Management drawn up by the countries in the CILSS and the Club du Sahel. They may also arise from bilateral agreements between the governments of developing countries and the donor community (see box 21 for the example of the *Programme de Restructuration du Marché Céréalier [PRMC]* in Mali). However, with the spread of democracy in Africa, the emergence of a civil society and the call for food sovereignty, aid co-management practices with donors are starting to show their limitations. For instance, in Sahel countries (Burkina Faso, Mali and Niger), in addition to the public stock co-managed with donors, another stock has been set up managed in a discretionary manner by the government.

Box 21

Coordination of public interventions as a tool for instrument governance: the case of the Programme de Restructuration du Marché Céréalier [PRMC] in Mali

In low-income developing countries, price instability is increased by unstable food policies. These countries lack the resources necessary to implement policies in this field, and when donors make up for this lack, their efforts are often made in a piecemeal, uncoordinated fashion that reduces the consistency of public interventions.

PRMC's solution to this problem is often cited as an example. The program was launched in 1981, just before a structural adjustment program was signed with the IMF, and was part of a proactive policy intended to facilitate and complement the market liberalization process. This policy aimed to promote food security by improving grain market efficiency and by reducing the distortions arising from public interventions.

PRMC's novelty was that it instituted State-donor joint decision-making for the use of two instruments that are highly strategic for the country's grain policy and food security: the emergency reserve (*Stock National de Sécurité, SNS*) and a fund built up from food aid (first, revenue generated by sale of the food received; then monetary aid). In both cases, State-donor co-management was based on dual signature. This scheme played a major role in driving grain and food policies. It presents two advantages.

First, it coordinates decision-making between donors and the State and – something far rarer – between donors themselves. This coordination has proved to function well – meetings of the PRMC technical committee are effective in terms of debate and decision-making – though they are driven more by donors than by the Malian experts and policy-makers who in the main are rather reticent about liberalization. It also led to improved coordination between the different structures within the Malian administration: namely the grain marketing board OPAM (in charge of managing the SNS and which has now been placed under the control of a State/donors plan contract) and the ministries of Finance, Trade and Rural Development. It succeeded in rendering grain policy more consistent and more effective.

PRMC's second advantage is that for two decades it has directly or indirectly mobilized substantial resources in support of dry cereals (millet, sorghum and maize), a sector hitherto neglected by an agricultural policy that focused on cotton and irrigated rice grown in the *Office du Niger* area.

Over its first phase (1981-87), PRMC helped the State withdraw from the grain sector (public monopolies were dismantled and price controls removed). It accomplished this by using food aid to avoid sudden price hikes and by restructuring OPAM and taking charge of SNS management. It then played a major role in building the market

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through actions to stimulate market competition and transparency in the face of an oligopoly of large wholesalers (namely those engaged in rice importation): it financed the grain market information system (MIS that was later converted into the *Observatoire du Marché Agricole* [OMA]), supported the setting up of small wholesalers' organizations, provided credit to wholesalers, and placed variable tariffs on imported rice. At the same time, PRMC organized itself in order to ensure its mission regarding food crisis prevention and management, which entailed the setting up of an information system (agricultural survey, grain balance sheets and EWS). PRMC therefore played a key role in a food security policy that was constrained by the structural adjustment program. In line with the aims of market liberalization, it prevented public stocks and food aid tools from being used to stabilize prices whereas at the same time it avoided food crises by preserving room for maneuver for public interventions targeted on populations and areas in difficulty.

Looking back on PRMC's activities, it may be stated that it has helped improve the efficiency of the grain market and food security in Mali. Its role in making grain policies consistent is often cited as a reference.

But is the PRMC model still valid today? As such, the model is suited to facilitating and complementing liberalization policies. Back then, when State intervention was vilified and strictly limited to the provision of public goods, co-management both helped the Malian authorities make the reforms recommended by donors and implement a number of measures excluded from the structural adjustment program (namely lending the SNS a role that went beyond the conventional role of emergency reserves). Today, the spread of democracy that began in the late 1990s, the weight of public opinion, the growing role of the media in consumer defense, the increasing popularity of the notion of food sovereignty, and recently, the new-found legitimacy of public interventions when food security is threatened, mean that the co-management model is no longer applicable.

PRMC's role was called into question in the early 2000s following a reduction in donor involvement and, above all, because the field of food security was reappropriated by the national authorities. PRMC was criticized for being first and foremost the donors' instrument and for having placed the emphasis on short-term policies that did not free the country from its dependency on imported food. The *Commissariat à la Sécurité Alimentaire* (CSA), reporting directly to the President, was set up in 2004 with a more comprehensive, strategic approach to food security and the goal of better connecting food crisis management (short-term food security) with the development of agricultural production (long-term food security). PRMC kept its mandate of food crisis prevention/management and it now operates as a CSA department. But its mission

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is henceforth part of a more ambitious framework that includes the decentralization of food security policy to municipalities and its inclusion in ECOWAS's regional agricultural policy. It can be imagined that the role of coordinating public inventions it inherited from PRMC will be quite a challenge for CSA to meet.

J. Egg

2.4.7. What can we achieve with D-instruments?

What attitude should governments and donors adopt with regard to D-instruments? These instruments play an indispensable role in protecting vulnerable households from food insecurity. Only D-instruments are able to ensure that insolvent households maintain their capacity to consume. D-instruments are therefore "must-haves", even though when used alone they are not enough to guarantee food security.

The manner in which D-instruments are used should nevertheless be modified. Their perverse effects must be reduced by improving their governance and, when possible, by choosing less distorting instruments. This will prevent them from damaging private stocks and more broadly the development of A-instruments. It is even possible, and desirable, to select and implement D-instruments in such a manner that they have beneficial effects on A-instruments. For instance, cash aid can connect insolvent consumers to the market. Also, public stocks induce food procurement that can be made an instrument of market modernization.

And above all, certain D-instruments must be used structurally rather than simply as crisis management tools. Here, the aim is to maintain or restore household capitals and thus maintain the capacity of households to manage risk (resilience). If it follows clear rules, the structural use of D-instruments also has the advantage of providing a degree of predictability for the beneficiaries of transfers. This reduces the risk facing these actors and thus encourages them to invest (a little like the expected effect of B-instruments). Finally, if the structural transformation of agriculture (sought through price stabilization) actually occurs, this will vest D-instruments with a new role (for which plans should already start to be laid): that of helping the transition of labor leaving agriculture.

Conclusion

This book has analyzed the possible strategies and instruments that can be used to manage the problem of food price instability in developing countries. What practical conclusions can we draw from this analysis?

Food price instability is a huge problem for developing countries

Food price instability on domestic markets has dramatic consequences for consumers with certain poor households being obliged to reduce their consumption during high-price periods. These temporary reductions in consumption may have long-term effects: a deterioration in the health of household members and even death for some. This decrease in human capital, caused by undernutrition, may lead to a fall in household income (as its production capacity is diminished) and an increase in its expenditures (for example on drugs). The household thus becomes even more vulnerable to future price shocks. Food price instability may also affect less poor households. Even though they are not obliged to reduce their food consumption during high-price periods, they are obliged – if they are to maintain their level of consumption – to dip into their savings or sell some of their assets. This decapitalization reduces the household's capacity to react to future shocks. Moreover, price instability causes agricultural producers to invest very little. This low level of agricultural investment in turn keeps prices unstable as production remains highly sensitive to climatic hazards and little responsive to price incentives. This instability also results in high production costs which in turn maintain food prices at high levels. When food products account for a significant percentage of household expenditures, or a country's trade balance or a State's budget, food price instability can also generate macroeconomic instability. In some cases it can also induce social unrest (see the urban riots that occurred in 2008 in about 40 DCs). All these phenomena (undernutrition, decapitalization, lack of investment, green revolutions blocked, macroeconomic and social instability) can hamper the economic development of DCs.

Food price instability on international markets further complicates the problem by generating instability on domestic markets, by making it more difficult for countries to use international markets to control their internal instability, and by generating balance of payments imbalances in some importing and exporting countries.

Food price instability cannot be controlled solely by modernizing production and markets

This is because food price instability has three root causes...

We have seen that food price instability in a given country may be natural, imported or endogenous. As imported instability itself is primarily the result of international price instability (of natural or endogenous origin), food price instability may be considered to be fundamentally due to natural factors and endogenous dynamics. These dynamics may be divided into two categories: firstly the cobweb and secondly speculative bubbles and panics. This means that we can identify three root causes of price instability:

Firstly, natural hazards and production sensitivity to these hazards. We have called this natural instability.

The second is the "simultaneous" nature of production choices: sowing dates are not so different for a given crop in different production areas (at least those in the same hemisphere) and production lags mean that when some farmers are sowing the others have not yet harvested their crop. Prices cannot therefore reveal to any given farmer the production choices already made by the others. This leads to incorrect price expectations (excessively optimistic if the price was high in t or excessively pessimistic if the price was low in t). Collectively, this generates an excessive production reaction to price variations (even though, at the individual level, production price elasticity is low). This is the cobweb.

The third cause is the positive feedback between price movements and price expectations. Here, a price rise encourages the belief that prices will continue to rise. This belief causes certain behaviors (massive purchases, stock retention) that drive prices up. This positive feedback is the basis of speculative bubbles and panics.

...which can neither be eradicated...

Certain natural hazards (diseases, pests) could always be slightly reduced, but will never disappear entirely. For those that are climatic in nature, the tendency is to increase and the notion that we can obtain a *status quo* (thanks to international climate talks) is already very optimistic. Appropriate technology (e.g. irrigation systems, drought-resistant varieties, phytosanitary products or glasshouses) could be used to render crops less sensitive to natural hazards. But this could never concern more than a small proportion of the world's agricultural production.

Attempts to prevent production decisions being taken simultaneously would mean using varieties with such a short cycle that when some farmers are sowing others have already harvested. A more balanced distribution of food production between

the two hemispheres could also help reduce the simultaneous nature of production decisions. But whatever we do, we could only reduce, never eliminate, the source of cobweb dynamics.

Finally, speculative bubbles and panics are based on deep-seated psychological determinants such as the fear of going short and the desire for profit.

If we accept that the causes of food price instability can never be eliminated, is it at least possible to buffer their effect by improving food markets?

...nor sufficiently buffered by food markets.

Food production can be a factor in price stabilization if it is highly responsive to price movements. Cropped areas or yields must be rapidly increased if prices rise, which means that extra land must be on hand or that inputs must be available to boost yields. This is not always the case. Additionally, even when this is the case, the production response is always uncertain (as it depends on climatic hazards) and delayed (the production cycle lasts several months).

Private storage has a stabilizing effect on prices, and it is recognized that storage buffers a large part of the instability caused by natural hazards (Williams and Wright, 1991). It also reduces cobweb dynamics. Finally, it discourages speculative bubbles and panics. But very little multiannual private storage in actual fact takes place.

Trade also has a very potent stabilizing effect by ensuring that deficits in some areas are compensated by surpluses in others. If trade is able to connect areas that are sufficiently far apart for natural hazards not to be correlated, it will diversify the risks stemming from natural hazards. Trade can also reduce speculative practices and panics but has a more ambiguous effect on the cobweb (some experts consider that trade tends to "synchronize" local cobweb dynamics, ultimately increasing price instability, cf. Boussard *et al*, 2006). Anyway, transport and transaction costs bound long-distance trade. Although it is possible (and desirable) to reduce these costs by developing infrastructures and market institutions, for products such as grain, the stabilizing effect of trade will always be limited.

The capacity of production, storage and trade to stabilize prices is also weakened by *vicious circles that make food price instability a self-sustaining phenomenon*. As price instability is a risk for agricultural producers, it complicates their access to credit and discourages them from investing. But without investment, agricultural production remains sensitive to climatic hazards and little responsive to price incentives, and this in turn maintains a high level of price instability. Price instability also makes storage,

and particularly multiannual storage, very risky.^[105] Storage is therefore discouraged, and this also contributes to maintaining price instability at a high level. Finally, food price instability also pushes households to fall back on self-consumption strategies, which in turn makes markets narrow and prices unstable.

Risk management instruments cannot protect the producers and consumers of developing countries from food price instability

In the 1980s and 90s, agricultural liberalization and the lapse or collapse of international commodity agreements (ICAs) led many experts to predict a boom in risk-hedging instruments (B-instruments). This has not yet happened in developing countries, at least not for grain or other food products. Crop insurance and futures markets have seen very little development in these countries. Moreover, even when they do have access to these tools, DC producers and traders make very little use of them. Theoretical reasons are behind this, namely adverse selection and moral hazard problems, and the systemic nature of certain risks (Newbery and Stiglitz, 1981; Cordier and Debar, 2004).^[106]

This of course may change in the future. Adverse selection and moral hazard problems may be reduced or overcome by developing new B-instruments. For example, weather-indexed insurance is better from this standpoint than crop insurance. The “systemic” nature of certain risks (correlated risks) can in part be resolved by allowing the local providers of risk-hedging tools to cover themselves through other B-instrument providers operating on a large scale. For instance, if traders and producer organizations have the possibility to hedge their own risk on futures markets, they may accept to set in advance the price they pay producers. Likewise, a microfinance institution or a company offering the producers in a given area credit or crop insurance may hedge the systemic risk of a poor harvest in this area by taking out weather-indexed insurance.

Action may also be taken to stimulate the development of B-instruments or boost their use by DC food producers and traders. This may take the form of technical support and even subsidies (see action already undertaken by the World Bank, cf. CRMG, 2008).

[105] Academic studies have shown that competitive private storage is optimal, but this is true only if it is assumed that actors likely to build up stocks (producers and traders) are risk-neutral (Williams and Wright, 1991).

[106] To which should be added practical problems stemming from a lack of information for market actors and the technicity of these instruments.

However, we should not forget that this approach has its own limitations. B-instruments will likely undergo a certain degree of use in developing countries, including in the food products sector. But access to these tools will likely – at best – be open to only a small percentage of the country's producers and traders, and this particularly applies to those involved in food products. The dashed hopes of the last 25 years should urge us to caution when considering the development potential of B-instruments. The rice futures contract set up in Bangkok in August 2004 (AFET White Rice 5%) often has no quoted price because of a lack of transactions.

At the same time, the capacity of public risk management tools (emergency D-instruments) to protect consumers in developing countries from price rises is itself also limited. Transferring food, cash or food vouchers to vulnerable households when crises occur has proved to be insufficient as a strategy. The 2005 crisis in Niger demonstrated that the main cause of malnutrition was to be found in the poor responsive capacity of households decapitalized by a succession of crises (Michiels *et al*, 2008; Michiels and Egg, 2008; Blein and Egg, 2009). Here again, risk management is not enough: a structural change is needed to increase household resilience.

We therefore, at this stage, appear to have reached a dead end. Food price instability cannot be controlled solely by modernizing production and markets. And the producers, traders and consumers of developing countries cannot be effectively protected from the consequences of this instability (because of the shortcomings of public and private risk management instruments).

The long-term solution lies in rendering price instability "inoffensive" through green revolutions and economic development

It should be recalled that the two main problems stemming from food price instability are that it obstructs green revolutions and causes food insecurity. Therefore, price instability is less serious in a country that has already completed its green revolution and whose potential productivity gains have already been made. Only modest investments are required (simply to replace worn out or obsolete equipment). Price instability may nevertheless still be a major problem for consumers. However, once a country has reached a sufficient level of development, the proportion of a household's income spent on food tends to fall. Falling food prices (in real terms) contribute to this. As does the increase in incomes induced by general economic development. When food accounts for a small proportion of household expenditures, food price instability is no longer a problem for consumers.^[107]

[107] Except for a few very poor households which should be helped using social transfers.

These two processes are closely interlinked as the structural transformation of agriculture induced by green revolutions is a necessary step along the road to general economic development (Timmer, 1988 and 2009a; World Bank, 2007; De Janvry, 2009; Barrett *et al.*, 2010). Green revolutions release resources (capital and labor) for other sectors of the economy. They reduce the cost of agricultural raw materials and food (which in turn contributes to improving the nutritional condition of the population and thus increases labor productivity). They generate foreign currency that can be used to import machines and other equipment. Last, but not least, green revolutions also result in increased agricultural income which *i*) boosts investment in education and health (and thus increases labor productivity) and *ii*) creates rural and urban employment in non agricultural sectors.

The problem consists in triggering the process, *i.e.* paving the way for a “structural transformation” in DC agriculture, while at the same time protecting consumers.

A scheme based on all four instrument categories is needed to protect consumers and pave the way for the “structural transformation” of DC agricultures

According to the dominant doctrine – which we called the “optimal strategy” –, it is the role of B-instruments to stimulate investments in agricultural production and markets (whereas it is the role of D-instruments to protect poor consumers from food insecurity, see 1.2.1). The rationale is that B-instruments (such as crop insurance, weather-indexed insurance and price risk hedging tools), make it less risky to invest. In theory, they may even stimulate investments by farmers and traders who do not use these instruments: if a large enough proportion of actors use the instruments and invest in agricultural production or marketing, this leads to less unstable prices and therefore encourages other actors to invest as well (this is what we called the “multiplier effect” of B-instruments, see 2.2.4). However, as we have already mentioned on several occasions, B-instruments have so far been very seldom used by DC economic actors. This could change in the future, but probably not to an extent that would result in the structural transformation of DC agricultures (in particular, it is unlikely that the critical mass required to induce the multiplier effect will one day be reached). And in fact, no examples can be cited of countries that have achieved their green revolution thanks to the security provided by B-instruments. History teaches us *i*) that successful green revolutions have occurred only when price instability was moderate, often thanks to floor prices supported by public schemes (see in particular the examples of the European CAP and Asian rice policies) and *ii*) that farmers are able to use B-instruments only after having increased their yields and their productivity.

The analyses presented in this book show that if developing countries are to achieve the "structural transformation" of their agricultures while also protecting their consumers from price surges, then they must use appropriate schemes based on a combination of A-, B-, C- and D-instruments. These schemes rest on the following six pillars:

Pillar 1: Instruments that aim to modernize production by stimulating investment in agriculture: *i*) public goods (research and extension services) and *ii*) temporary input subsidies (if necessary accompanied by the possibility to defer payment);

Pillar 2: Instruments that aim to modernize markets by stimulating producer and trader investments in infrastructure and market institutions: *i*) the public goods necessary to allow markets to function properly (e.g. weights and measures) and *ii*) temporary subsidies for certain instruments such that they can develop despite circularity problems (2.1.5);

Pillar 3: Instruments that aim to stabilize expectations by providing information: *i*) harvest forecasts, *ii*) prospective analyses of upcoming changes on the international market, *iii*) stock estimates;

Pillar 4: Instruments based on public interventions that aim to hold prices within a predefined band by stabilizing internal availabilities : *i*) public stocks, and/or *ii*) variable import and export tariffs or subsidies, and/or *iii*) import or export quotas;

Pillar 5: Instruments that aim to transfer resources to vulnerable households both during price crises (thus preventing nutritional problems and decapitalization) and structurally (thus recapitalizing households): *i*) cash transfers with or without a matching contribution; *ii*) transfers in kind with or without a matching contribution;

Pillar 6: Instruments used by States that aim to stabilize their budget or the country's balance of payments: *i*) futures markets; *ii*) weather insurance and *iii*) credits.

Pillars 1 to 4 constitute a price-stabilizing scheme that can tackle all three types of instability and their possible combinations. The resulting price stabilization will in the short term protect consumers and producers, and in the long term will cause agriculture to undergo a structural transformation in both its dimensions (production and markets). This scheme will break the vicious cycle between price instability and agricultural investment, and that between price instability and market narrowness due to self-consumption. Pillars 1 to 3 are based on A-instruments. Pillars 1 and 2 help agriculture undergo a structural transformation both by stabilizing prices and

removing other “obstacles” to production and market modernization (e.g. a lack of public goods or circularity problems). Pillar 3 will increase market transparency and price predictability. Pillar 4 is based on C-instruments and serves to stimulate the investments necessary for the structural transformation of agriculture, and protect consumers. A balanced scheme that protects both producers and consumers is easier for the population to accept. The ceiling price serves both to protect consumers and enhance the predictability of public interventions. Without such a ceiling, all know the State will intervene if prices rise “too much”, but do not know where the intervention-triggering threshold is located. Finally, to ensure that the system operates, the ceiling price must not be placed too low for in this case a large proportion of storage and trade will no longer be profitable and the market will no longer be able to function properly.

The system made up of pillars 1 to 4 will protect consumers in three ways. In the short term by providing a ceiling price. In the medium term by causing food prices to fall. This fall results from the modernization of production (green revolutions decrease production costs) and the modernization of markets (large-scale spatial arbitrage results in production being located in areas where production costs are lowest). In the long term, since the general economic development stemming from the structural transformation of agriculture will lead to staple food products accounting for only a small proportion of household expenditures (therefore, any instability in their prices will have few consequences in terms of food security). Yet this is not enough to protect consumers, which is why *pillar 5 – based on D-instruments* – is necessary (see 1.4.1). Even moderate price rises may be enough in developing countries to push vulnerable households into the red. Also, price stabilization cannot help those who have already fallen into the poverty trap. D-instruments are therefore necessary both conjuncturally (during crises) and structurally (for household recapitalization). D-instruments also play an essential role by accompanying the structural transformation of agriculture. First, they can maintain or restore the connection between the market and poor producers and consumers (through food vouchers or cash transfers). Second, they are crucial in helping many rural households as they leave agriculture by connecting them with non-agricultural rural activities and providing access to the labor markets. Finally, D-instruments will always be needed in the long term (even in cases of successful development) to help poor, vulnerable households. In this case, they may primarily take the form of structural social transfers, as is already the case in OECD countries.

In developing countries, food price instability does not only affect households (producers and consumers). It also has an impact on macroeconomic variables, particularly

the State's budget and the balance of payments. This impact may result directly from price instability or arise from State policies enacted to counter price instability. For example, reductions in import tariffs cause fiscal revenue to fall. In this case, the instability is transferred from prices to the State's budget. This is a major problem insofar as food price instability can in this case disrupt the country's entire economy. Also, the budgetary impact of stabilization policies may compromise their sustainability. *The solution here is for States to protect themselves through B-instruments (futures markets, agricultural insurance, credit): this is pillar 6.* Let us suppose for example that the State protects itself by taking out weather insurance. If the harvest is poor, it must intervene (for example by releasing a part of public stocks onto the market, or by decreasing import tariffs). These measures are relatively expensive, but their cost is in part reimbursed by the insurance company. The same strategy can be used with futures markets to provide protection against international price instability (see box 10 on the experience of Malawi in 2005).

The scheme should of course be adapted to include the specificities of each different country, as we have already seen (1.5.2). The weight of the different pillars may be different from one country to the next. The instruments mobilized within a given pillar may also vary. For example, pillar 4 – depending on the country – may rest on public stocks, the regulation of imports, the regulation of exports, or on a combination of these instruments (2.3.3). Finally, pillar 4 must only be used if it can be subject to appropriate governance given that unpredictable public interventions may well increase, instead of decrease, price instability (see box 15). The scheme loses its consistency if pillar 4 is missing and the “structural transformation” of agriculture may not occur. However, if pillar 4 is included but is poorly managed, the situation is even worse.

The scheme should also be updated to match the country's progression along its development path. The full scheme described above is suitable for developing countries that have not yet accomplished their green revolution. Their agricultural yields and labor productivity are low. Food prices are high and account for a substantial proportion of household expenditures. Food price instability is a problem both for producers (green revolution obstructed) and consumers (food insecurity). This is the current situation in the vast majority of DCs. When countries have already completed their green revolution, pillars 1 and 2 can be reduced by decreasing then doing away with subsidies on inputs and market instruments. Similarly, pillar 4 can also be reduced, the floor price being gradually lowered then abolished. However, the floor price must not be reduced too rapidly so that labor flows out of agriculture at a rate that can be absorbed by non-agricultural rural and urban activities. Price instability may nevertheless still be a problem for consumers. This means that pillars 4 and 5 should

be maintained, pillar 4 being based only on a ceiling price and pillar 5 being based on transfers that are both structural and conjunctural (activated in crisis periods). Finally, food price instability continues to cause macroeconomic imbalances, and here State use of insurance instruments (pillar 6) comes into its own. For countries that are well along the path in their economic development, grain and other staples account for only a small proportion of household expenditures and price hikes have few consequences in terms of food security. This means that pillar 4 may be removed (end of the ceiling price) and pillar 5 may be reduced (structural transfers to poor households are still necessary, but emergency interventions are no longer needed as food crises no longer occur). Additionally, the weight of grain production in GDP and in international trade has sufficiently decreased for price instability to no longer be a source of macroeconomic imbalance. Pillar 6 (State use of insurance instruments) may be replaced by the provision of information and training that facilitates the use of these instruments by private actors (producers, traders, processors) ^[108]

Here is should be specified that setting up this scheme may be constrained by various limits over which States have little control, in particular foreign exchange resources, budget resources, international price instability and WTO rules. Which gives the international community a vital role to play.

The international community has a key role to play

The international community has a key role to play in helping developing countries manage food price instability. This role may be divided into three components: provision of bilateral aid to DCs, revision of WTO rules, and creation of an enabling environment through a reduction in international price instability.

Helping developing countries manage food price instability

Two types of support are needed: *i*) support for DCs to set up food price instability management schemes and *ii*) specific support for countries facing difficulties paying their food imports bill. This support may take the form of bilateral or multilateral cooperation.

Helping DCs set up high-performance food price instability management schemes (FPIMS) through technical assistance, the training of experts and financial aid. Technical

^[108] The recommendation to gradually do away with input subsidies and floor prices does not imply that agriculture no longer needs public support in developed countries. It means that this aid (if justified) should take other forms. If the aim is to internalize the positive externalities generated by agricultural activities (the "multifunctionality" of agriculture), then aid should depend on compliance with "good practices". If the aim is to encourage a new structural transformation in agriculture (an "ecological" intensification, also called the "doubly green revolution"), aid here again must be conditional.

assistance is often necessary to help design these schemes. Training the experts who will later be charged with implementing, operating and monitoring the scheme is also crucial. Last, but not least, financial aid is needed as many developing countries may find effective scheme implementation difficult given their limited budgetary resources. This in particular is the case for policies designed to modernize production and markets (pillars 1 and 2) and for safety nets, namely multiannual safety nets that aim to recapitalize vulnerable households and thus increase their resilience (pillar 5). Price stabilization policies (pillar 4) are less costly but are nevertheless beyond the reach of many DCs. External aid is therefore often necessary, otherwise interventions may well be too restricted (therefore ineffective) or intermittent (and therefore fail to provide security to private actors). It would seem advisable therefore to set up a *competitive international fund* to provide financial aid devoted to supporting price stabilization policies (pillar 4). And this to tackle two problems. The first problem is that poorly managed stabilization policies run the risk of causing a crowding out effect on private stocks and imports, and thus increase rather than decrease price instability. The second problem is that donors are reluctant to fund policies that have been condemned for 25 years by the dominant doctrine. A competitive international fund could contribute to solving them both. Introducing conditionalities and competition between stabilization projects would guarantee the good governance of these policies, particularly concerning transparent intervention prices and compliance therewith. The fund would also lead to an accumulation of experience, and lessons learned would be shared between DCs and the donor community. In this way, people's perception of the advantages and limitations of stabilization policies would be based on empirical evidences rather than on preconceived ideas. This means that the fund could kick off with quite modest sums, with the idea being to initially finance a few pilot schemes.

Helping "vulnerable" importing countries pay their food imports bill. International price instability and/or production instability in DCs may cause sudden increases in the food bill paid by importing countries. In certain countries this may cause the exchange rate to fall or, worse, may lead to food import rationing. In such situations external aid must be provided. This aid may take the form of food aid, but also credit facilities or technical and financial support that facilitates government use of risk hedging tools (weather insurance, futures or options). In certain low-income countries it may also take the form of a public scheme to stabilize food import expenditures (inspired by the STABEX experience).

However, the measures countries are allowed to use to stabilize prices on their domestic market are restricted by WTO. The international community can therefore also help DCs by revising WTO rules in the light of their impact on food price instability and food security.

Reshaping WTO rules

WTO rules restrict the rights of countries to regulate their imports and exports.^[109] By so doing, they may deprive countries of the most effective stabilization instruments they have. On the other hand, policies enacted by countries to regulate their imports and exports may accentuate price instability on international markets. For example, if exports are restricted in response to soaring international prices, this reduces supplies on international markets, further increasing prices (as happened in 2008: Headey and Fan, 2008; Christiaensen, 2009; Headey, 2011). These are clearly negative externalities where the policies of certain countries have a negative effect on other countries. WTO rules must therefore find the right balance: if too strict, they will prevent countries from protecting themselves from turbulence on the international market or from using the international market to protect themselves from internal sources of instability; if too lax, they will increase the instability of international prices.

Current WTO rules are a long way from striking this balance. Sometimes they are too strict. For instance, variable import tariffs are prohibited (except in very special cases) even though these are essential if importing countries are to stabilize domestic prices, and often have only a fairly minor destabilizing effect on international prices (particularly when levied by "small" countries). On the other hand, WTO rules may sometimes be too lax. They allow countries to restrict food exports to any extent they wish, and this can cause international prices to soar, or greatly accentuate price surges (as occurred in 2008). It therefore seems reasonable to propose that importing DCs should be given more freedom to use variable tariffs, and this especially concerns "small" importing countries whose grain imports account for only a small proportion of international trade. At the same time, the right of exporting countries to ban grain exports should be restricted while leaving them the possibility to protect themselves from international price surges.^[110]

[109] More precisely, they restrict the use of measures aiming to reduce imports (tariffs, quotas) or stimulate exports (subsidies). These rules therefore prevent countries from protecting themselves against falls in international prices. They also prevent them from using border measures when facing surplus harvests within the country. In addition, WTO prohibits all tariffs and subsidies indexed on international or domestic prices. It authorizes *ad hoc* tariff changes under certain conditions, but the indexed nature of variable tariffs is critical if this instrument is to be effective as this alone guarantees tariff predictability (necessary to limit the crowding out effect on private stocks) and tariff reciprocity (necessary to ensure that this instrument is accepted by producers and consumers).

[110] A manner to proceed would be to authorize export quotas, with volumes set such to ensure sufficient supplies for the domestic market. Experience gained with food aid (where volumes are often based on estimated food balance sheets) has shown that such an approach is feasible.

This change in WTO rules is necessary, but highly unlikely ever to be brought about.^[111] Moreover, even if new rules were to be adopted, they would hardly be enforced, at least for rice which is crucial to the food security of the main exporting countries. Were the international price of rice to soar, the governments of these countries are likely to restrict rice exports (even if such restrictions were forbidden by the WTO) in order to keep domestic prices at levels compatible with food security and social stability. In other words, it is unrealistic to rely only on WTO rules to prevent "export ban bubbles" (as happened on the rice market in 2008). The practical implication of this is that action should be taken by the international community to reduce food price instability on international markets.

Reducing food price instability on international markets

Reducing food price instability on international markets is not a substitute for national or regional policies that aim to reduce food price instability on DC domestic markets. First, it affects only imported instability. Second, it deals with only part of this imported instability as parity prices may also vary because of changes in exchange rates or transport costs. But *reducing international price instability would create a far more favorable environment for DCs*. We have seen that they often find it difficult to protect themselves from imported instability (1.3.2.). And international price instability also complicates their use of the international market to counter natural instability (1.3.2). Last, but not least, for some products (such as rice and to a lesser extent wheat) the instability of international prices tends to be a self-sustained phenomenon (see the export bans bubble that occurred in 2008).

A widespread idea is that it is "impossible" to stabilize international prices through storage policies. This idea is based on the presumption that the only way to reduce international price instability is to build up huge public stocks managed by the international community. It also stems from the bitter aftertaste left by the failure of International Commodity Agreements (ICAs). Almost all the stabilization schemes set up by these agreements were dismantled in the 1980s, either because they were too costly (the case for cacao) or subsequent to disagreements between producer and consumer countries (the case for coffee). But in both cases the problems encountered were exacerbated by the fact that *the real aim of ICAs was not to stabilize but to*

[111] The proposal to change WTO rules in order to restrict the rights of countries to ban their food exports was discussed in 2011 during the G20 negotiation process. However, due to opposition from certain countries, the proposal included in the G20 action plan is far more modest (the measure is restricted to exports of "food purchased for non-commercial humanitarian purposes by WFP", see G20, 2011). Also, this modest proposal has not been endorsed by WTO.

support prices (Gilbert, 1996; OECD, 2011). It cannot therefore be concluded from their failure that it is impossible for public schemes to stabilize international prices.

In addition, using storage to stabilize international prices does not necessarily involve the constitution of international public stocks. Less complex options can also be envisaged, based on the idea that the management of national or regional stocks can be coordinated. We have already seen that prices soar only when stocks are low (see OECD, 2011 and figures 11 to 13). Maintaining stocks at sufficient levels would therefore avoid price surges on international markets. This could be achieved through an international agreement whereby countries (or Regional Economic Communities) undertake to keep stocks equivalent to at least x months of their own consumption. Another version of national stock coordination could concern the combined use of these stocks in periods of crisis.

Finally, international price instability could also be reduced by specific policies that tackle the main causes of international price instability: lack of market transparency, excessive speculation on futures markets, biofuels, climate change, the cyclical nature of agricultural investment and massive land purchases in certain countries.

Acronyms and Abbreviations

1GMIS	First Generation Market Information System
2GMIS	Second Generation Market Information System
ACP	African, Caribbean and Pacific
AFD	<i>Agence française de développement</i>
AFET	Agricultural Futures Exchange of Thailand
AGRA	Alliance for a Green Revolution in Africa
ASEAN	Association of South East Asian Nations
BULOG	Indonesian Food Logistics Agency
CAP	Common Agricultural Policy
CBs	Cereal Banks
CCA	<i>Cellule crise alimentaire</i> (Niger)
CGD	Center for Global Development
CIF	Cost, Insurance and Freight
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CIRAD	<i>Centre de coopération internationale en recherche agronomique pour le développement</i>
CMC	<i>Commission mixte de concertation</i> (Niger)
COMESA	Common Market for Eastern and Southern Africa
CRMG	Commodity Risk Management Group
CSA	<i>Commissariat à la sécurité alimentaire</i> (Mali)
DC	Developing Country
DfID	Department for International Development (UK)
DJ-AIG	Dow Jones – AIG Commodity Index
DNPGCA	<i>Dispositif national de prévention et gestion des crises alimentaires</i> (Niger)

EAC	East African Community
EAGC	Eastern Africa Grain Council
ECART	European Consortium for Agricultural Research in the Tropics
ECOWAS	Economic Community of West African States
ECX	Ethiopian Commodity Exchange
EDRI	Ethiopian Development Research Institute
EGTE	Ethiopian Grain Trading Enterprise
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO Statistics Division
FCFA	<i>Franc de la communauté financière africaine</i>
FOB	Free on Board
FPIMS	Food Price Instability Management Scheme
FSA	<i>Fonds de sécurité alimentaire</i> (Niger)
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GIEWS	Global Information and Early Warning System
GMO	Genetically Modified Organism
GNP	Gross National Product
GREMA	<i>Groupe de recherche et d'échange sur la régulation des marchés agricoles</i> (France)
ICAs	International Commodity Agreements
ICT	Information and Communication Technologies
IDDRi	<i>Institut du développement durable et des relations internationales</i> (France)
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute

IGC	International Grain Council
IMF	International Monetary Fund
INRA	<i>Institut national de la recherche agronomique</i> (France)
IRAM	<i>Institut de Recherches et d'Applications des Méthodes de Développement</i> (France)
KACE	Kenya Agricultural Commodity Exchange
LDC	Least developed country
MAEE	<i>Ministère des Affaires étrangères et européennes</i> (France)
MIS	Market Information System
MRCs	Market Resource Centres (Kenya)
MSU	Michigan State University
NAIC	Nigerian Agricultural Insurance Corporation
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NRI	Natural Resources Institute
OdR	<i>Observatoire du riz</i> (Madagascar)
OECD	Organisation for Economic Co-operation and Development
OMA	<i>Observatoire du marché agricole</i> (Mali)
OPAM	<i>Office des produits alimentaires du Mali</i>
OPVN	<i>Office des produits vivriers du Niger</i>
OTC	Over-the-Counter
PACDEX	Pan African Commodity Derivatives Exchange
PCP	<i>Plateforme de concertation et de pilotage de la filière riz</i> (Madagascar)
PO	Producer Organization
P_M	Import Parity Price
PRMC	<i>Programme de restructuration du marché céréalier</i> (Mali)
PSNP	<i>Productive Safety Net Programme</i> (Ethiopia)
P_X	Export Parity Price

RATIN	Regional Agricultural Trade Intelligence Network (East Africa)
S&P GSCI	Standard & Poors - Goldman Sachs Commodity Index
SAFEX	South African Futures Exchange
SIDA	Swedish International Development Agency
SIE	<i>Stock d'intervention de l'État (Mali)</i>
SIMA	<i>Système d'information sur les marchés agricoles (Niger)</i>
SIMB	<i>Système d'information sur les marchés du bétail (Niger)</i>
SNR	<i>Stock national de réserve (Niger)</i>
SNS	<i>Stock national de sécurité (Mali, Niger)</i>
SPAU	Stabilization Policy Analysis Unit
STABEX	EEC-ACP export earnings stabilization scheme
STABIMP	Food import expenditures stabilization scheme
ToT	Training of Trainers
TWLB	Tanzania Warehouse Licensing Board
UCE	Uganda Commodity Exchange
UEMOA	<i>Union économique et monétaire ouest-africaine</i>
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VAT	Value Added Tax
WFP	World Food Programme
WRS	Warehouse Receipts System
WTO	World Trade Organization
WUR	Wageningen University and Research Centre
ZACA	Zambia Agricultural Commodity Agency
ZAMACE	Zambia Agricultural Commodity Exchange
ZIMACE	Zimbabwe Agricultural Commodity Exchange
ZNFU	Zambia National Farmers Union

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This bibliography includes both the publications cited in the text and other references that may be used by readers interested in deepening their knowledge of certain aspects.

Many references concern the instruments mentioned in the text but often focus only on one category. In this case the category is indicated by the corresponding letter (A, B, C or D) in the column on the right. Some references consider several categories as they analyze either their positive interactions – e.g. if the paper argues that stabilization policies facilitate green revolutions – or their negative interactions – e.g. if the paper argues that stabilization policies cause a crowding out effect on private stocks. In this case all the categories concerned are indicated in the column on the right. Finally, some references compare the performance of two categories, and this is indicated by the symbol “vs.” (see for example Newbery, 1989).

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Managing food price instability in developing countries

Food price instability has dramatic consequences in developing countries where it hits consumers hard and causes food insecurity. The risk it entails for producers is so great that it discourages them from investing. It therefore obstructs green revolutions, and thereby blocks the road to economic development. In certain cases, price instability also generates political instability and macroeconomic imbalances. Ever since the crises of 2005 (in the Sahel) and 2008 (on international markets), the management of price instability has figured large in the policies of developing countries and is back on the international agenda (G20 action plan; work by FAO's Committee on World Food Security).

Based on a comprehensive review of the theoretical and empirical literature, this book identifies and analyzes four “pure” strategies that can be employed to manage food price instability. It clearly underlines the limitations of conventional solutions that rely on mixing a risk management strategy (using insurance-based instruments) with a crisis management strategy (using emergency aid). It explains why more structural solutions that require considerable State involvement are needed to stimulate the modernization of agricultural production and markets, and recapitalize vulnerable households. This cannot be achieved solely by facilitating access to inputs and by transferring assets to poor households: public intervention is necessary to prevent prices from reaching extreme values. Such interventions must be based on a combination of instruments that match the specificities of the national or regional context. The international community has a key role to play in the success of these policies.

This book is intended for policy-makers, researchers, teachers, students, and all those interested in price instability, food security and the agricultural development of Africa, Asia and Latin America.

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PREFACE

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