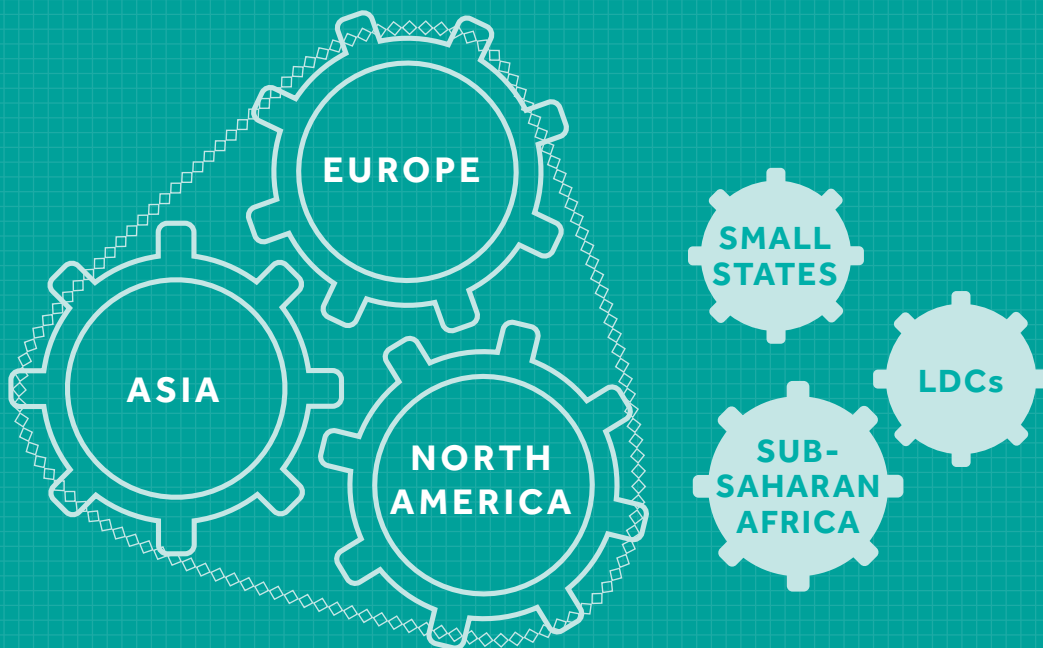
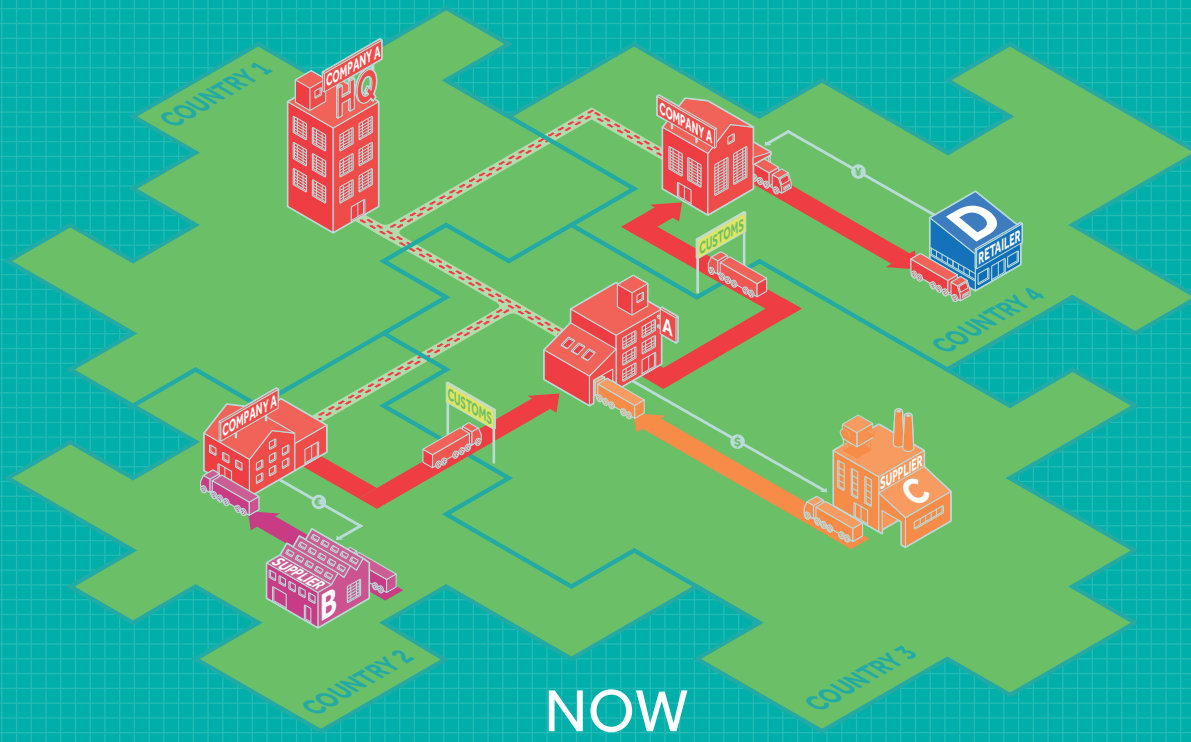
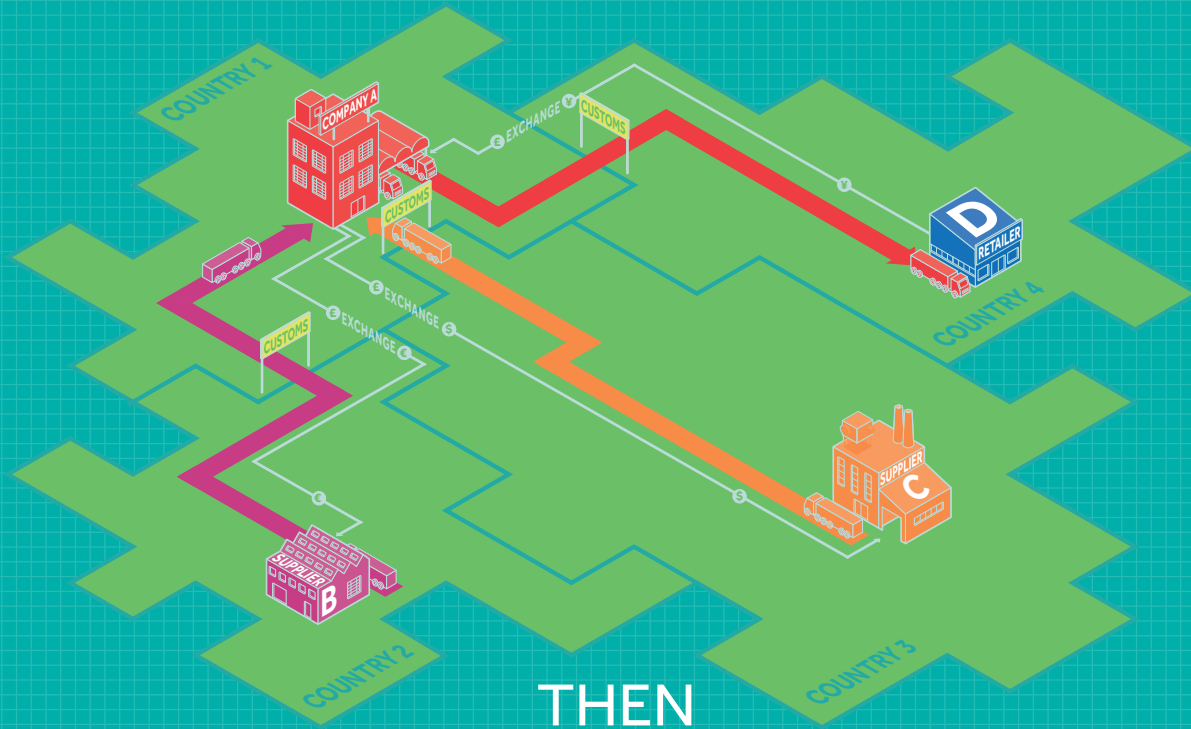


Section 3:

Sectoral Developments





Chapter 7

Commodity Price Volatility: An Evolving Principal–Agent Problem

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Abstract

This chapter analyses the changing dynamics within commodity markets and increasing price volatility using a principal–agent framework. Adopting this more micro-perspective helps to shed light on the role of informational asymmetries within trading relationships and how these may be influenced by contractual arrangements. More fundamentally, this chapter reflects on how the fragmentation of production processes within commodity markets has influenced the transmission of information. In some cases, this has increased the opportunities for opportunistic behaviour. Within the context of agricultural commodity markets, the chapter reflects on the interactions between four entities: institutions, governments, markets and individuals. To address some of the challenges that may result from information asymmetries, a number of options to advance compatibility of incentives are identified, including greater consideration of contractual arrangements, price-risk management instruments and the creation of commodities exchanges within producing countries.

7.1 Introduction

Price volatility in primary commodity-producing economies has long been an issue of concern to development economists and policy-makers. The academic literature on the causes and consequences of price volatility

has a long pedigree and that literature extends across a range of diverse issues.² These include:

- a) What are the underlying structural factors that lead some less developed countries to depend heavily on just a small number of primary commodity exports for much of their export revenues?
- b) What is the impact that such price volatility has on income volatility among farmers and other producers of such commodities?
- c) What risk management strategies can be adopted to reduce price volatility, and what role can price-risk management mechanisms such as commodity futures and options play in reducing this risk?
- d) What are the practical implications of different types of interventions in commodity markets aimed at stabilising prices? These interventions have varied over the years from the traditional international commodity agreements (ICAs), which ended in the 1980s and 1990s, to the more recently created commodity exchanges (Gilbert 1996).

The main aim of this short chapter is to consider the efficacy of these alternative forms of intervention in terms of a proposed framework (or taxonomy) based on a *principal–agent* perspective. This taxonomy will then allow us to formulate a *scorecard* approach to evaluate the alternative interventions. Finally, with

the aid of a short case study of the Ethiopian Commodity Exchange, we will then be able to analyse whether or not such a market-based intervention is preferable to other forms of intervention such as the ICAs.

7.2 What are the main risks faced by commodity producers?

The literature has long recognised that the risks faced by producers vary across products and countries, as well as according to the size of the producer. Small producers will face greater challenges than larger producers, especially in having to deal with ‘natural’ or catastrophic risks (e.g. due to adverse weather and other factors such as pestilences). Small producers often lack the knowledge and know-how to be able to utilise the full range of market-based risk management instruments (UNCTAD 1998). It should be noted that farmers are prone to *production risk* as well as *price risk* from these natural sources.³ The cost of insuring against adverse events can be prohibitive for small producers.

In terms of price risk there are similar constraints, especially on small producers, which limit their capacity to use futures markets for their products. Two such constraints are the issue of *standardisation* and the need to ensure the *quality* of their produce. Even the possibility of using international prices as benchmarks may be problematic when domestic prices are often not correlated strongly with international prices (e.g. because of *high transfer prices*). Governments are probably in the best position to use the full range of financial instruments such as futures, options or over-the-counter (OTC) contracts.

7.3 Commodity price volatility: from a stakeholder approach to a principal–agent approach

In a seminal paper by Varangis and Larson (1996), a *stakeholder* approach is adopted to

analyse commodity price volatility. Varangis and Larson suggest commodity price volatility can be analysed in terms of the interactions between four entities: *institutions*, *governments*, *markets* and *individuals*.

The emphasis of this chapter will be to analyse the various types of interventions in commodity markets within a *principal–agent* framework, which in essence is a more formal version of a stakeholder approach. Our main contention is that, as a consequence of the many reforms in commodity markets and especially the move from ICAs to the use of market-based instruments such as derivatives and, in more recent years, the creation of local commodity exchanges within producing countries, evaluating such initiatives in terms of the principal–agent framework can provide insights.

As suggested by Varangis and Larson (1996), the role of *institutions* is pivotal. The impact of institutions will depend on the legal and regulatory context in which the production of primary commodities is organised in developing countries. If there is a formal marketing board (such as the Ghana Cocoa Board, Cocobod) whose responsibility is to co-ordinate and market the overall supply of the commodity to markets, it will make a difference whether it operates as an active market participant (buyer) or as a third-party margin (buffer) provider. If the latter, the marketing board’s role will be simply to absorb surplus output, or to provide extra supply (from previous buffer stocks) when supply would otherwise be low.

The second stakeholder entity is the *government* in the producing country. Its role will depend on how dependent the economy is on a particular commodity in terms of overall export revenues. UNCTAD defines commodity-dependent developing countries (CDDCs) as those that depend on commodities for at least 60 per cent of their total export revenues (UNCTAD 2015a). A general trend over the

last 30 years has been to reduce government intervention in these commodity markets and to allow a greater role for the market, usually after a period of market liberalisation. In many cases this involved the scrapping of marketing boards and the ending of buffer stock regimes. This was often done alongside wider reforms, e.g. currency devaluations and price deregulations. The literature has suggested that such reforms have contributed to commodity price volatility (Gemech and Struthers 2007; Gemech *et al.* 2011).

The third entity is the *market*. Different commodities will face diverse international market structures, which will determine the scope that individual producer countries have to determine output levels. Oil is very different from coffee, cocoa and tea. The former may be heavily controlled by a large cartel such as the Organization of the Petroleum Exporting Countries (OPEC), and the market power that a major swing producer such as Saudi Arabia enjoys. For beverage crops such as coffee, cocoa and tea, the market structure is quite different, with no formal international cartel in operation, even though there are still some swing producers (e.g. Brazil and new producers such as Vietnam in the case of coffee). Central to this issue is the pivotal role played by some of the large buying companies.⁴ For many primary commodities, there is a complex dynamic between the *suppliers* (the farmers), *buyers* and the various intermediaries which operate between both. In this context, much has been written on the complexities of global value chains (GVCs) for a wide variety of commodities. Indeed, it could be argued that each commodity has its own unique type of GVC (UNCTAD 2013).

The fourth entity from the Varangis and Larson study is the *individuals* who play such a central role within primary commodity-producing countries. We can identify no fewer than five individual participants within the GVC for most primary products: the *producer* (e.g. farmer), the *retailer* (e.g. a marketing board),

a *government procurement official*, an *exporter* and of course the ultimate *buyer*. For most primary commodities, the supply (or value) chain is complex and lengthy. The adoption of appropriate price-risk management instruments might simplify and shorten these chains, which ultimately may be to the benefit of producers and farmers. Moreover, the adoption of a formal commodity exchange, such as that operating in Ethiopia, can also facilitate this.

There is no doubt that, the longer and more complex is the supply (value) chain for a particular commodity, the more complex are the potential principal-agent problems. The seminal article on principal-agent theory is that of Jensen and Meckling (1976), which presented a framework that is ubiquitous to all contracts and which we apply here to commodity markets.

In all contracts in which one party (the principal) delegates tasks to another party (the agent), the principal-agent problem is characterised by the following potential conflicts of interest between the two parties:

- 1) *goal conflict* (more formally referred to as *incentives misalignment*);
- 2) *verification or monitoring problems*, i.e. the principal cannot (or it is prohibitively costly to) verify what the agent is doing at all times; and
- 3) the fact that the two parties to a contract will have *different risk preferences* (this relates to *moral hazard* and *adverse selection*).

An overview of principal-agent problems appears in Boxes 7.1 and 7.2.

One of the central themes of Varangis and Larson's paper is that the potential for conflict between the four entities arising from, say, price risk can be reduced provided that the producers (farmers) can avail themselves of the full range of price-risk management instruments available to them. We discuss this in terms of a *principal-agent* framework.

Box 7.1

Principal–agent (P–A) theory overview

- | | |
|---|--|
| <ol style="list-style-type: none"> 1) <i>Main concept</i>: P–A relations need to internalise an efficient organisation of information and risk-bearing costs. 2) <i>Unit of analysis</i>: contract between P and A. 3) <i>Assumptions</i>: self-interest, bounded rationality, risk aversion, goal conflict, | <ol style="list-style-type: none"> information asymmetry between P and A, ability to purchase information. 4) <i>Contracting issues</i>: moral hazard and adverse selection, risk sharing. 5) <i>Examples</i>: measuring performance, regulation, transfer pricing. |
|---|--|

Prior to the reforms in commodity markets within producing countries, *marketing boards* played a significant role in these markets. We can refer to them as the *principal* and the producer (farmer) as the *agent*. Now, with marketing boards no longer playing such a dominant (or, for many commodities, any) role, it is likely that the *international trader* (exporter) will be the *principal* and the *producer* (farmer) will be the *agent*. However, it is more

complex than this. In the consuming country it may be the *international buyer* who now plays the role of *principal*.

What this means is that principal–agent relationships can change and evolve over time, and it is possible that individual market participants can be both principals and agents according to their different roles and their positions in the GVC. Moreover,

Box 7.2

The main predictions of principal–agent theory

The main predictions of principal–agent theory are:

- | | |
|---|---|
| <ol style="list-style-type: none"> a) Information asymmetry leads to opportunistic behaviour by agents (shirking). b) Opportunistic behaviour is greater when the contract is behaviour oriented (based on salaries, hierarchical governance), as opposed to an outcome-oriented contract (bonuses and commissions rather than salary, use of stock options, market governance). c) Outcome-oriented contracts are more effective in limiting opportunism (i.e. the principal and agent are more likely to avoid goal conflict). | <ol style="list-style-type: none"> d) The principal has to invest in information systems to verify the agent's behaviour. e) The greater the role of outcome-based contracts, the lower is the agent's level of risk aversion. f) Task programmability and measurability are easier when the contract is outcome based. g) Goal conflict is lower when the relationships between principal and agent are long term rather than short term. h) Greater decentralisation in decision-making (e.g. within the supply/value chain) leads to a stronger focus on costs. This leads to behaviour-based contracts rather than market-(outcome)-based contracts (also a transaction cost issue). |
|---|---|

these changing and overlapping roles will be influenced by such factors as market liberalisation and development of price-risk management instruments, including formal commodity exchanges. We argue that the principal–agent problem may have become more complex after market liberalisation (Boxes 7.1 and 7.2).

Prior to market liberalisation, most commodities had to be supplied to the market through marketing boards (regarded as the *principal*), which would negotiate transactions either directly with farmers (the *agent*) or via their farmer associations (*principal* to the farmers, but *agent* to the marketing board). The interaction of these different intermediaries is the essence of the principal–agent problem. The potential for *multiple principal–agent relationships* is strong. This is even before we get to the exporting level, where another set of principal–agent relationships emerge between the marketing board (the *principal*) and the exporter (the *agent*).

Since market liberalisation, the principal–agent problem now also extends to the consuming countries. Once again the potential for *multiple (overlapping) principal–agent relationships* exists, e.g. between importer, market brokers and final consumers. Before market liberalisation, the ICAs were the international equivalents of the domestic marketing boards, since they operated as physical market trading entities (e.g. the International Coffee Agreement). It could be said that markets were controlled by a type of *bilateral monopoly*.

After market liberalisation, the principal–agent problem arguably becomes more complex. This is because although the domestic context for producers became less complex with the disappearance of the marketing boards, which acted as intermediaries between the producers and the exporters, along with the demise of the ICAs at the international level, there is the potential impact of *speculators* to consider. As a consequence of market liberalisation, it can be argued that domestic

intermediaries have simply been replaced by new (international) intermediaries in the form of brokers and speculators.⁵ The complexity of all of these principal–agent interrelationships will be compounded by the inherent supply/value-chain (GVC) complexities that exist in commodity markets, which will vary from commodity to commodity.

7.4 From international commodity agreements to domestic commodity exchanges

The ICAs (*commodity stabilisation funds* and *buffer stocks*) were mechanisms used up until the late 1980s to stabilise commodity prices, as well as to increase their average price levels. These types of market interventions were very inflexible. Moreover, because many primary commodity prices are subject to long and variable cycles, they were also costly to implement, as they incurred high transaction and brokers' costs. Invariably the costs of such interventions were borne by the producers and governments in the exporting countries. Varangis and Larson (1996) suggest the following reasons for the demise of the ICAs:

- a) conflicts between producing and consuming countries;
- b) the complex GVC issues that often beset such agreements;
- c) their inability to respond to changes in both production and consumption patterns; and
- d) their failure to establish realistic price levels in the context of steady and persistent price falls for many of these commodities in the 1980s and 1990s.

We also argue that their demise can be explained within a principal–agent framework.

A priori, it can be argued that a greater reliance on market mechanisms such as commodity derivatives will pass on more risk and uncertainty to producers and away from

governments. Certainly, one result of market liberalisation is to pass on commodity price risk from government to the private sector. For many primary commodities, investment decisions have to be made long before any actual production is realised. This is especially true of many tropical products such as the beverage crops, coffee, tea and cocoa. However, as Gemech *et al.* (2011) have argued, the existence of a futures price for their commodities should improve the resource allocation of producers. Without the availability of such derivatives instruments, their profit margins would need to be much higher to protect them in the event of adverse price movements.

In the context of the main objective of this chapter, it is worth debating whether each actor in the value chain will benefit equally from the existence of a futures or options instrument for their product. The exporter, which is probably furthest removed from the production stage, is likely to benefit most, partly as a consequence of being able to benefit from economies of scale as it scales up its activities. Of course it can also be argued that it is the exporter that bears the greatest risk, almost as much as the primary producer. As far as the producers themselves are concerned, for many primary commodities there may be insufficient volume to be able to participate in a futures contract, as well as appropriate infrastructure, know-how and capital to benefit from such transactions. However, they can benefit indirectly through intermediaries, which, as third parties, may be able to bear the volume risks collectively on behalf of a group of producers. The same role can be performed by farmer associations or co-operatives.⁶

In recent years, commodity exchanges have been established in a growing number of emerging and developing economies such as Brazil, China and India, as well as an increasing number in African economies, although sometimes with only limited success (Ethiopia, Kenya, Uganda, Malawi and South Africa).⁷ Originally, prices within these exchanges

simply mirrored those in developed-country exchanges. More recently, however, there has been increased trading in locally based exchanges, which facilitates the avoidance of exchange rate risk as well as basis risk, as is the case with the ECX.⁸

7.5 Principal–agent theory applied to commodity markets: a suggested taxonomy

Table 7.1 outlines a taxonomy of these main principal–agent indicators by comparing possible outcomes *before market liberalisation* and *after market liberalisation* in commodities markets for a range of alternative market interventions including the setting up of a *commodity exchange*. It also shows the potential impact of different types of commodity supply/value chains (GVCs) on these indicators.

An overall conclusion in terms of the principal–agent indicators is that the move towards local commodity exchanges in developing countries may have reduced the negative outcomes arising from the principal–agent framework. For example, to the extent that long-term relationships can be more easily established between the producers and these exchanges, this can be expected to reduce goal conflict (increase *incentive compatibility*) between principal and agent. However, as the table shows, this will also depend on the extent to which the local commodity exchanges are able to persuade the producers to adopt a more output-based approach to production and move away from a behaviour-based approach.

This potentially favourable outcome will also depend on whether or not the local commodity exchanges can develop a sufficient presence in producing countries. A common problem that can hinder the successful operation of commodity exchanges is when the underlying markets are thin and lack sufficient liquidity. Here there is a crucial role for effective *information dissemination*. This has been well documented by international organisations

Table 7.1 A comparison of possible outcomes *before and after market liberalisation* in commodities markets for a range of alternative market interventions

*Principal-agent indicators	Before market liberalisation		After market liberalisation		Impact of supply/ value chains
	ICAs and marketing boards	Commodity stabilisation funds (e.g. IMF CCFF)	Derivatives, futures, options (ETF)	Local commodity exchanges	
1) Contracts (behaviour-based versus outcome-based)	Satisficing behaviour; rent seeking; shirking	Ex-post adjustments; potential satisficing behaviour	Reduced rent seeking; 'efficiency' (depends on effect of speculation)	If more outcome based, has incentive effect	Complexity high depending on supply chain
2) Assumptions (self-interest, bounded rationality, risk aversion)	Bounded rationality high; risk aversion by agent high	May reduce risk aversion; risk mitigation	Basis risk and counterparty risk still exist; futures/ options prices remain volatile	Low liquidity; thin markets; consuming countries (buyers) may have more power	Complexity high depending on supply chain; bounded rationality and risk aversion high
3) Goal conflict (asymmetric information, moral hazard, adverse selection)	Moral hazard and adverse selection high	Moral hazard and adverse selection high	Neutral	Long-term relationship may reduce goal conflict	Goal conflict will be high if supply chain is complex
4) Risk sharing (asymmetric)	Potential 'loss aversion' approach based on prospect theory	Some potential for risk sharing	With options, downside risk minimised; with futures, high margins needed	Reduced; exchanges play a strong price discovery role	Other risks (e.g. weather, idiosyncratic); long and complex supply chains give more power to buyers
5) Transaction costs	High	Neutral	Reduced	Reduced	High costs; depends on supply chain; number of intermediaries
6) Verification and monitoring costs	High	High	Reduced	Reduced; government cost reduced	High costs

Notes: CCFF, compensatory and contingency financing facility; ETF, exchange-traded funds; IMF, International Monetary Fund

such as UNCTAD (2009). The hope is that commodity exchanges will be able to play an increasingly significant role to help producers in terms of *price discovery* (UNCTAD 1998, 2009).

An important caveat is that there is now more of a possibility that the negative effects of the principal-agent problem will originate from

consuming countries rather than producing countries. This may also be a consequence of the increasing financialisation of commodities markets, especially since the global financial crisis of 2008, which led many investors (e.g. hedge funds) to re-allocate their investments into commodities and away from equities, bonds and currencies. Although this process can be very cyclical, the overall trend in the last

20 years has been for this type of investment to increase (Tang and Xiong 2012). More generally, the principal–agent taxonomy allows us to concur with the conclusions of Fitter and Kaplinsky (2001) and the South Centre (2013), who have argued that a major effect of market liberalisation in commodity-producing countries has been that it has contributed to the consuming countries having more power and the producing countries less power. This negative outcome will be greater the more complex are the supply/value chains for individual commodities.

7.6 Conclusions and policy implications

This short chapter has attempted to contextualise the issue of commodity price volatility within the framework of principal–agent theory. It reviewed the relevant literature and considered a variety of market interventions in commodity markets, ranging from the traditional interventions, such as ICAs and domestic marketing boards, to the more recent price-risk management schemes such as commodity derivatives (futures and options) and commodity exchanges. The chapter's main conclusion is that the market for primary commodities, especially in the period after market liberalisation, is potentially more complex than in the period before market liberalisation. This is especially true if these markets have become more complex and dominated by multiple principal–agent relationships. This complexity has been reflected in greater volatility for a range of these products.⁹

This volatility is greater for some products than others. For example, in the market for tropical beverages such as coffee, tea and cocoa, this may also be attributable to a combination of supply-side factors. These include overproduction caused by new producers coming on to the market (e.g. for coffee), technical advances, the introduction of lower-quality products entering the market (again in the case of coffee) and complex supply/

value chains, which can lead to a disconnect between the prices paid by final consumers and the prices paid to producers.¹⁰ This disconnect is largely due to *rent-seeking* behaviour by various intermediaries, who can be expected to appropriate the gains achieved by producers/farmers in terms of productivity improvements. In the case of coffee, this appropriation can be severe because of the many layers within the supply/value chain (Ponte 2002).

Fitter and Kaplinsky (2001) have argued that, for coffee production, the value chain is such that an increasing proportion of the total income accruing in that market has gone to economic agents within the importing countries rather than the exporting countries. This is due to an asymmetrical distribution of power within the coffee value chain. This problem is accentuated by the fact that production is often fragmented in the producing countries. In addition, within importing countries, the conflict between *importers*, *roasters* and *retailers* to grab their share of the rents derived at different stages of the value chain can accentuate negative impacts on farmers.¹¹ Similar power struggles may exist in the value chains of other commodities.

A key message of this chapter is that, within the context of the principal–agent framework, price-risk management instruments and, where possible, the creation of commodity exchanges may at least achieve a degree of *incentives compatibility*. Moreover, the adoption of a local commodity exchange, such as the ECX, may be viewed as a further extension of these market-based instruments, especially if understood within a principal–agent framework. In that context, such institutions help to mitigate some of the principal–agent conflicts that can beset these markets, especially in terms of risk sharing and potential goal conflicts between principals and agents. Of course, principal–agent conflicts will remain no matter what institutional structure pertains within commodity markets. This is equally true of the ECX, where such conflicts will continue to

exist between the owners, the members and the managers of the exchange.

This conclusion is valid, even in the face of a potentially more complex set of principal-agent conflicts that may arise from such an institutional arrangement, especially in a post-liberalisation world. We are not suggesting that local commodity exchanges are a panacea for the issue of commodity price volatility and commodity dependence generally. Rather, the way forward for primary commodity-producing countries still lies in longer-term solutions to diversify their export base away from an overdependence on commodities. However, this objective has to be pursued at the same time as the key stakeholders (producers/farmers, exporters) ensure that they maximise their gains at different points along the GVCs for their commodities.

Notes

- 1 Director of the Centre for African Research on Enterprise and Economic Development (CAREED), School of Business and Enterprise, University of the West of Scotland.
- 2 An earlier version of this chapter was presented at the UNCTAD (United Nations Conference on Trade and Development) Multi-Year Expert Meeting on Commodities and Development, 20–21 March 2013, Geneva.
- 3 Papers by Dercon (2004), Dercon, *et al.* (2005) and Morduch (1995) analyse a range of different shocks that can adversely affect vulnerable countries (e.g. Ethiopia), as well as the necessary consumption- and income-smoothing aspects of these shocks.
- 4 Usually large buying companies such as Nestlé and Starbucks, rather than countries, play this role.
- 5 This complexity is compounded by the existence of different types of speculators that act in various capacities as market participants. These include *informed*, *uninformed* and *noise traders*.
- 6 There are examples from developing countries where these farmers' associations and co-operatives have been effective in operating on behalf of producers. For recent evidence on this, see the recently published UNCTAD report on *Smallholder Farmers and Sustainable Commodity Development* (UNCTAD 2015b).
- 7 Rashid, *et al.* (2010) have suggested that the development of domestic commodity exchanges in many African countries is impeded by the small size of many domestic commodity markets, poor

physical infrastructure and inadequate legal and regulatory environments. For these reasons, they argue that the development of regional exchanges might be a better option for such countries. This will be beneficial to member countries if combined with improving investment in transport and other physical infrastructure (e.g. warehousing) and improved information services.

- 8 Exchange rate risk and basis risk can themselves emanate from diverse sources (e.g. tariff and other non-tariff barriers).
- 9 See UNCTAD (2012) for a discussion of this volatility.
- 10 See UNCTAD (2004) for a discussion of trade performance and commodity dependence in African economies.
- 11 See UNCTAD (2011) for a technical discussion of the underlying causes of price volatility in world coffee and cocoa commodity markets.

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