Hedging to Safety: A Political Economy of Derivatives, Risk and Agriculture in the Developing World

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HEDGING TO SAFETY:
A POLITICAL ECONOMY OF DERIVATIVES, RISK AND AGRICULTURE
IN THE DEVELOPING WORLD

A Dissertation
Presented to
The Dean and Faculty of the Josef Korbel School of International Studies
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of the Requirements for the Degree
Doctor of Philosophy

by Sasha Coler Breger Bush
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Advisor: Dr. Ilene Grabel
ABSTRACT

It has become common for researchers and international development institutions to recommend the use of derivative instruments to developing country farmers and policymakers as a means of insuring agricultural incomes against the threats posed by volatile global commodity prices. Despite such enthusiasm, very little research to date examines whether or not derivative instruments actually can deliver income support to agricultural producers who face commodity price risk. This dissertation evaluates these recommendations, focusing upon the potential income security benefits of hedging with futures instruments for coffee farmers in Mexico, Brazil and Uganda during the 1998-2002 coffee crisis. The three-part quantitative and qualitative analysis undertaken focuses upon: 1. The ability of futures hedging to address the income insecurity of coffee producers (with income security having four dimensions: certainty, stability, adequacy and (in)equality); 2. Difficulties accessing futures markets, especially among small producers, due to various obstacles such size, yield risk, cost, information and knowledge; and, 3. Policy innovations and alternatives that could enhance the services provided by futures markets, supplement, or replace them in the coffee context. The data suggest that futures hedging provides an ambiguous income security service that in some cases can improve farmer income security, while in other cases making farmer incomes more insecure. Further, no hedging strategy tested was able to address all four aspects of
farmer income (in)security simultaneously, suggesting the need for policymakers to consider alternative commodity price risk management arrangements. The data additionally suggest that substantial portions of the coffee farming populations of the three case countries are systematically excluded from futures hedging due to the presence of severe obstacles to substantive participation. Alarmingly, many of the futures market intermediaries erected by development institutions and/or national policymakers in the three case countries also fail to include small coffee producers, and sometimes provide risk management services of dubious quality. The dissertation concludes with suggestions for cautious and limited application of futures instruments by governments to the problem of coffee farmer income insecurity, as well as suggestions about alternative arrangements that may be of greater income security assistance to small coffee producers.
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CHAPTER ONE

Introduction

“But no society could stand the effects of such a system of crude fictions even for the shortest stretch of time unless its human and natural substance as well as its business organization was protected against the ravages of this satanic mill…”

-Karl Polanyi¹

“In an ideal world with perfectly symmetrical information and complete and well-functioning markets, all risk management arrangements can be market based.”

-The World Bank²

In May 2001 six coffee farmers from the Mexican state of Veracruz were found dead in the Arizona desert. Having left their farms to seek respite from the coffee crisis, the farmers died of starvation and dehydration only to have their bodies dumped by the coyotes who had smuggled them across the US border. Eleven years after signatories failed to renew the quota clauses of the International Coffee Agreement, the human costs of a liberalized coffee market were in this way underscored.

Low and volatile commodity prices have serious social consequences. According to a 2005 report from the UN Committee on Trade and Development (UNCTAD), “When evaluated through the prism of poverty reduction, the notorious price volatility that has long plagued world commodity markets is among the most pressing of challenges facing developing countries. Price volatility breeds risk, and vulnerability to risk is recognized

¹ 1944: 76.

as one of the four dimensions that constitute poverty (UNCTAD 2005, 8).” Recognitions like these are not new—the past century of coffee history is littered with similar observations about the devastation to farming communities wrought by unfavorable changes in prices. What are new, however, are contemporary assertions that certain financial markets are the key to severing the noxious link between price volatility and farmer well being.

Like the 1998-2002 period, the 1930s Great Depression was a terrible time to be a coffee producer. World coffee supplies had grown in the years prior such that when the Depression hit and demand plummeted coffee prices fell quickly and far. Producers across the coffee-growing world clamored for relief. Pervading the ideological climate of the 1930s was the idea that market problems required social, public solutions. Indeed, “the economic system [ceased] to lay down the law to society and the primacy of society over that system [was] secured” (Polanyi 1944, 259). Such was the case with coffee. After several failed attempts, an international, governmental, cooperative solution to coffee price volatility took shape with the 1962 ratification of the International Coffee Agreement (ICA). The ICA constituted a commitment by importing and exporting nations to manage coffee supplies through quotas and stabilize and raise coffee prices. While not the only reason to socialize coffee price risk, ensuring farmer well being was among the stated goals of the system.

The year 1989 marked the end of the ICA’s quota clauses and publicly managed coffee prices. The two price crises since 1989 have led to renewed interest in the very same issues that policymakers were contemplating in the Depression era. Partially distinguishing contemporary debates from these older ones, however, are assertions that
in derivatives markets a solution might be found. Rather than socializing coffee price risk, increasing numbers of researchers and development institutions argue that price risk management should be marketized. Price risk does not have to be prevented as the ICA sought to do; instead, it can simply be sold.

The story of coffee since 1989 contains within it a broader narrative of economic globalization. Precipitated first by the opening of China in the early 1970s and later by Reaganism, Thatcherism, debt crises across the global South and the failed Soviet experiment, developed and developing countries alike made unprecedented moves to open national economies to global trade and finance. Likewise, governments of coffee-producing countries began taking steps to open domestic coffee markets to global competition and free trade. Like other forms of 20th century economic management the ICA fell prey to the growing force of neoliberalism.

As with other programs of economic liberalization, the liberalization of coffee markets was at least in part intended to enhance economic freedom. No longer would farmers have to produce at levels specified by governments, refrain from planting new trees, market only to licensed exporters, or bear the heavy taxes levied by marketing boards. Important in its own right, proponents argued that this newfound freedom would also boost productivity and economic growth.

Market liberalization freed coffee producers to increase production and sell coffees of lower quality than the ICA had permitted. Coffee-exporting governments released their buffer stocks. Countries like Vietnam, which had been prevented from doing so under the ICA, entered the world market as new producers. The world’s supply of coffee steadily rose and competition between producers became fierce.
The second coffee crisis to have occurred since 1989 began in 1997. Beginning at that time coffee prices fell such that by 2001 they had reached their lowest real levels in over one hundred years, lower even than their levels during the 1930s Depression. Farmer protests were rampant across the developing world. Some lost their land. Others, like the six farmers who died in Arizona, migrated to look for work elsewhere. Still others went hungry. Small coffee farmers tended to suffer more than their larger and wealthier counterparts.

If recent market-led economic globalization has opened up new opportunities for individuals across the globe, it has also generated insecurity. John Gray writes: “The natural counterpart of a free market economy is a politics of insecurity” (in Lechner and Boli 2004, 25). This is what Polanyi also suggests with his dark descriptions of the self-regulating market, that “satanic mill” that “ground men into masses” (1944, 35). The modern history of coffee is thus intertwined with broader narratives of economic globalization and gives concrete form to assertions like those made by Gray and Polanyi. It is an exemplar of the contradictions between economic freedom and insecurity that are increasingly manifest across the global neoliberal economic landscape.

Even further, there is a forward looking dimension to the works of Polanyi and Gray that bears on this discussion. Polanyi’s formulation suggests that society will ultimately counter the advancement of the free market with policies and programs to both tame its appetites and compensate for its failures. Gray is much more explicit: “today’s regime of global laissez-faire will be briefer than even the belle époque of 1870 to 1914… In the normal course of democratic political life the free market is always short-lived. Its social costs are such that it cannot for long be legitimated in any democracy” (in Lechner and
Boli 2004, 25). The World Bank is similarly concerned: “[W]here prices are liberalized and markets opened to international competition, the risk that results from exposure to volatility in international prices can lead to a backlash against liberalization and pressures for state interventions to close markets or support prices, either of which can be extremely expensive for domestic markets” (2004, 218). Thus, economic insecurity entails political costs that can place the neoliberal economic policy project in jeopardy.

It is here that futures markets insert themselves into the story. Since the 1970s derivatives market trading has exploded in tandem with (and indeed because of) wide-ranging efforts to liberalize global trade and financial flows. While commodity futures markets had operated in the United States since the mid-1800s, gradual agricultural trade liberalization beginning in the 1970s provided commodity derivatives trading with a new momentum. As instruments designed to address economic volatility it is no surprise that their popularity rose as commodity markets became more integrated and interdependent. Market integration provided for the rapid global transmission of information and shocks across formerly-distinct markets, creating that volatility upon which derivatives markets feed. Over the past several decades derivatives exchanges, once the almost exclusive purview of the advanced economies, have been rapidly sprouting up across the developing world.

When derivatives are discussed in the business presses and academic circles, the conversation usually revolves around the spectacular failures of big firms (Barings Bank, Long Term Capital Management, Enron) and the correlate threats posed to international financial stability. As with recent commentaries about the role of credit derivatives in the
US housing and mortgage crisis, these markets are generally pictured as the stomping grounds of an elite group of financiers whose gambles threaten systemic ruin.

Yet, derivatives are quietly starting to spring up in other sorts of conversations. Rather than being relegated to the elitist margins of finance, it is argued that derivatives can help ordinary people manage some of the risks associated with economic liberalization. Yale economist Robert Shiller stands out in this small but growing cohort. He proclaims: “We need to democratize finance and bring the advantages enjoyed by the clients of Wall Street to the customers of Wal-Mart” (Shiller 2004, 1). Among his suggestions are proposals for individual use of home equity derivatives to secure against declining home values\(^3\), the use of derivatives on occupational indexes to secure against declining individual incomes, and the use of GDP derivatives to offset the impact of cyclical downturns in aggregate economic activity.

But nowhere has this movement to democratize derivatives made bigger strides than in developing country agriculture. Proponents argue that derivatives markets are argued to be capable of filling the economic security void left when governments abandoned agricultural market interventions. For example, UNCTAD argues: “Commodity exchanges make it possible for farmers to achieve price predictability and security, despite the volatility, over a crop cycle (and, for storable commodities, for a further six months to one year). This is particularly relevant because, with the withdrawal of government support for developing-country agricultural producers, short-term shocks in the prices of key export products are increasingly felt at the level of the farmer” (2005, \(^3\) Indeed, this has already happened. Derivatives on the Case-Shiller housing price indices (20 major residential market indices are available) have been trading on the Chicago Mercantile Exchange for the past several years.)
8). The United Nations Food and Agriculture Organization (FAO) and the World Bank’s International Task Force on Commodity Risk Management (ITF), among others, have recently made similar statements (e.g. FAO 2007b; ITF 2006a,b, and c).

Among other characteristics that recommend the use of derivatives to proponents (more in Chapter 2), the greater efficiency, producer freedom and policy coherence associated with such arrangements, relative to the ICA system, are among the most widely cited. For example, the ITF points to the greater efficiency of market-based price risk management tools: “Unlike government supports that artificially prop up prices, these instruments can provide some protection for producers using sustainable market-based tools” (ITF 2006c, 1). The Task Force also speaks to the matter of policy coherence: “A market-based approach to risk management may serve as a catalyst for reform and enhance the sustainability of liberalization programs in some commodity sectors” (ITF 2006c, 1). Advocates thus claim that derivatives markets can, among other things, secure farmer incomes in the face of price volatility efficiently and consistently with broader programs of agricultural liberalization.

But can derivative instruments actually do for farmers what UNCTAD, the FAO and the World Bank say they can? How comprehensively do derivatives markets address the threats to farmer well being posed by price behavior in globalized commodity markets? It is surprising that these questions have not yet been addressed, even as prominent development institutions recommend the integration of derivatives markets into developing country agricultural policy. Lence notes: “The promotion of instruments such as futures to manage commodity producers’ price risks is based on the implicit assumption that they are conducive to improvements on the wellbeing of their adopters
(2003, 4, emphasis added).” In this dissertation I interrogate this assumption through a systematic, policy-oriented analysis of the extent to which futures markets would have provided for the well being of coffee farmers during the 1998-2002 crisis.

In the analysis that follows I adopt two overlapping analytical and normative ‘lenses’—income security and small farmers—and employ them to evaluate the potential of derivatives markets to provide for the well being of coffee farmers in a liberalized market setting. I explore the issue in three different country contexts: Mexico, Brazil and Uganda. While several narrower research questions also frame various parts of the dissertation, most generally I ask the following: To what extent do derivatives markets provide for the income security of small coffee farmers? And, what does this imply for policy?

I ultimately marshal significant evidence to support the conclusion that recent enthusiasm for derivatives-based solutions to the problem of price volatility in the developing country coffee farmer context is largely unwarranted. I further conclude that while there are perhaps some limited applications of derivative instruments in the coffee context (I suggest several), the time, energy and resources of policymakers and other actors might be better spent elsewhere if small farmer income security is deemed an important policy goal. The organization of the dissertation is as follows.

The next chapter, Chapter 2, first discusses the relevant scholarly literature on the topic and then addresses the research methodology that underpins and frames the analysis. The literature review discusses the more scholarly literature on derivatives and coffee, and also surveys the more policy-oriented literature on derivatives and agricultural development that has arisen mainly from international development
institutions and non-profit organizations. In the methodology section, I devote several sections to explaining and justifying the income security and small farmer ‘lenses’ that I employ, the cases that I have chosen and the specific analyses that I undertake in various parts of the dissertation.

Chapter 3 is a background chapter that address the two main topics addressed in this dissertation: coffee and derivatives. I first provide descriptions and explanations of the coffee plant, coffee production, the global coffee commodity chain (GCCC), coffee markets, coffee prices and historical efforts to manage coffee price risk. I then provide relevant background information on derivatives markets, including popular contract types, clearing and settlement mechanisms, future price behavior, and the recent growth in derivatives markets since the 1970s.

Chapter 4 begins a three-part investigation into the research question at hand. More specifically, Chapter 4 presents a “best case” portrait of the income security potential of hedging on futures markets for coffee farmers in Mexico, Brazil and Uganda using data from the 1998-2002 coffee crisis period. By the end of the chapter, the following narrower research question is addressed: What exactly can futures hedging do for the income of coffee farmers?

Chapter 5 moves on to discuss futures markets from the perspective of small farmer access. In the three case countries, small farmers in particular (although not exclusively) tend to face enormous obstacles to effective futures trading, such as size, yield, and cost obstacles, among others. By the end of the chapter, the following narrower research question is addressed: What is the nature and extent of those obstacles that prevent small farmers from effectively using futures markets?
Chapter 6 combines the two lenses used up to this point, income security and small farmers, in a more explicitly policy-oriented discussion of futures market intermediation and income security alternatives. I first evaluate recent efforts in the three case countries to link small producers to futures markets via intermediation of various types. I then move on to look at a selection of income security alternatives in the three case countries and briefly compare them to futures markets. By the end of this last chapter in the three-part investigation, the following narrower research questions are addressed: Do efforts at futures market intermediation warrant the time, energy and resources of policymakers and other actors involved in such initiatives? And, what income security alternatives are available for small farmers in the coffee context?

Chapter 7 concludes the dissertation. Here I summarize my findings, discuss their implications for coffee and agricultural policy, and suggest avenues for future research.
CHAPTER TWO
Literature review and methodology

“Like a monstrous octopus, poverty spreads its nagging, prehensile tentacles into hamlets and villages all over our world. They are ill-housed, they are ill-nourished, they are shabbily clad. I have seen it in Latin America; I have seen it in Africa; I have seen this poverty in Asia.”
-Martin Luther King, Jr.

“Man is small, and, therefore, small is beautiful.”
-E.F. Schumacher

Introduction

This chapter situates the dissertation within the scholarly literature and explains the methodological and ethical precepts that frame it. In the first half of the chapter, I present the three broader literatures to which this project contributes and is indebted: the literature on derivatives markets in the global economy, with its Keynesian and neoclassical economic variants; the multidisciplinary literature on the global coffee economy; and, the more policy-related literature on derivatives and agricultural development. Whereas the former two are largely academic literatures, the latter is comprised mostly, though not exclusively, of reports, summaries and memoranda from various international institutions and non-profit organizations.

The discussion of method in the second portion of the chapter begins with a three-part explanation and justification of the two analytical and normative lenses that frame

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the analysis: income security and small farmers. I then discuss the selection of the three country cases that focus the investigation: Mexico, Brazil and Uganda. This is followed by a detailed discussion of the research program that informs the body of the project in Chapters 4-6. I conclude the discussion of methodology by providing the reader with three different ways that the method, purpose and organization of this project might be usefully understood.

I discuss my project relative to the broader literature directly below. This is followed by a discussion of methodology. I have broken these two large sections into topical subsections for ease of reading.

**Literature Review**

This dissertation seeks to answer the following question: To what extent do futures markets provide for the income security of small coffee farmers? As such, the project sits at the intersection of several scholarly literatures oriented around the following topics: the role of derivatives markets in the global economy; the changing contours of the global coffee economy; and, the specific, potential developmental role of derivative instruments in the developing country agricultural context. Each of these literatures inform and speak to the investigation to varying degrees. That said, none have adequately addressed the particular issue that I raise in this dissertation.

In the subsections that follow I summarize, explain and critique the work of these other scholars and researchers, as well as situate my project within this literature. The discussion of the derivatives literature comes first, followed by the global coffee
economy. I conclude with an examination and critique of the policy-oriented literature on derivatives and agricultural development.

**Derivatives markets in the global economy**

The substantial literature on derivatives might usefully be divided into two broad categories: political economy treatments of the macro-effects of derivatives on the global economy and on society that evidence a Keynesian orientation; and, more technical microeconomic and sectoral applications of derivatives to problems of risk management that reflect a more orthodox, neoclassical orientation. My investigation is bracketed by these two bodies of literature insofar as it offers a critical, political economic treatment of derivatives markets as applied to the risk management problems of coffee farmers. In other words, I *politicize* the technical treatments found in the risk management literature, and introduce a different *level of analysis* to discussions in the political economy literature.

**IPE treatments in the Keynesian tradition**

The international political economy (IPE) literature has focused predominantly, though not exclusively, on one dimension of global derivatives market growth and expansion: speculative trading and the destabilizing effects thereof for the global financial system. This focus gives the literature a rather Keynesian character. As noted in the introduction, Warren Buffet has called derivative instruments “financial weapons of mass destruction” in this context (in Bryan and Rafferty 2006, 43). Lack of collateral

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6 An explicit focus of Keynes’ *General Theory* (among other of his works) is the destabilizing influence of unregulated (or poorly regulated) financial markets on the national and global economy. Keynes’ participation in the 1944 Bretton Woods Conference contributed to the erection of national and international regulatory regimes that imposed significant controls upon the free flow of capital across national borders.
requirements and insufficient reporting and accounting requirements (with the significance of such regulatory inadequacies magnified by the enormous leverage that derivatives afford traders) have been among the primary faults found with over-the-counter (OTC) derivatives trading. The global panic surrounding the spectacular collapses of Barings Bank and Long Term Capital Management in the 1990s, and the later collapse of Enron (all in part caused by defaults on off-balance-sheet OTC market liabilities) gave rise to a growing IPE literature that focuses upon speculation, global financial fragility, and the imprudence of laissez-faire regulatory approaches to financial markets.

Dodd (2005) incorporates such well-known failures in derivatives markets into recommendations for greater “prudential regulation”, including the institution of collateral requirements in order to prevent defaults on derivatives obligations. Elsewhere Dodd and Hoody (2002) note the ease with which Enron accumulated enormous OTC-related liabilities, out of view of shareholders and other interested parties. Steinherr offers a more colorful characterization along these lines, arguing that derivatives are “wild beasts of finance” with an “indomitable nature” capable of devastating “the financial landscape” (2000, xv). He quotes the Economist which notes: “there are fears that derivatives fuel financial-market uncertainty by multiplying the leverage, or debt-based buying power, of hedge funds and other speculators—an uncertainty that could, if the things went wrong, threaten the whole of the world financial system” (in Steinherr 2000, xv). Such sentiments are echoed in the writings of other scholars (e.g. Tickell 1999; Bryan and Rafferty 2006; Dodd and Griffith-Jones 2006; Figlewski 1997; Garber 1998; Stultz 2004; Darby 1994).
While still relatively sparse, new research on the destabilizing influence of derivatives trading has begun to examine the impact of these financial flows during times of financial crisis. Dodd (2002) notes that in the 1990s East Asian financial crisis derivatives may have magnified the impact of rapid capital inflows and outflows, contributing to a rapidly destabilizing, downward financial spiral. Partnoy (1999) tentatively links J.P. Morgan’s dealing in PERLS (Principal Exchange Rate Linked Securities) to the dramatic 1997 collapse of the Thai baht.

Generally such analyses remain macroeconomic in nature, focusing on the world financial system and coordinated international regulatory regimes that might in the future prevent speculative trading from undermining financial stability. One notable exception to this dominant trend is recent work by Dick Bryan and Michael Rafferty that appears in their new book Capitalism with Derivatives. While similarly taking a global, macroeconomic view of derivatives markets, the authors depart from the mainstream IPE literature on derivatives in that they make a concerted and sustained effort to place derivatives in a social context.

The authors’ main insights are that derivatives allow different sorts of financial assets to be commensurate with one another in a process they call “blending”, and that they create ties between the present and the future in a process called “binding”. They argue that today different sorts of assets are blended together (priced relative to one another), for example when derivatives allow for a swap of bonds for equities. Likewise, derivatives allow for the binding of present with future when, for instance, future prices in commodity markets determine cash prices which determine future prices. What apparently differentiates this book from the rest of the IPE literature is its insistence on
derivatives having social meaning, in contrast to arguments that place such instruments in
the ‘fictitious’ economy. Further, the authors’ distinct Marxian perspective leads them to
contemplate the role of derivatives markets in the ‘capitalist system’ and its consequences
for labor. That said, issues of systemic impact, regulation and speculation take center
stage here as well. By contrast, this dissertation takes a microeconomic look at
derivatives markets, focusing on the utility of such instruments for coffee farmers facing
price volatility.

**Microeconomic treatments in the neoclassical tradition**

Researchers in other fields, mainly economics, finance and agricultural development,
depart from the mainstream IPE literature insofar as they take a microeconomic or
sectoral view of derivatives that focuses not on speculation, but mainly on the capacity of
derivatives to allow for risk management by individuals and firms in various sectors of
the economy.

Often highly technical, this literature tends to be dominated by “quants” in the fields
of econometrics, mathematical economics and finance, computer science, and even
physics. A lot of it reads as an instruction manual, giving practical advice to traders and
risk managers (e.g. Teweles and Jones 1999; Eeckhoudt, Gollier and Schlesinger 2005;
Horcher 2005; DeRosa, ed. 1998; Peters and Warwick 1997). Some compare and
contrast different trading algorithms, approaches and techniques in the interest of finding
the most profitable and effective means of hedging various corporate risks (exchange rate
risks, interest rate risks, corporate default risks, etc.). Still others, “financial engineers”,
brainstorm new instruments and new uses for derivative products. While presumably
intended for practical application, another segment of the technical literature tends toward
the abstract-theoretical in its attempts to find logic in price and basis movements, the
relation between futures and storage markets and so on (e.g. Fama and French 1987;
Foster and Viswanathan 1995; Pindyck 1990; Hennessy and Wahl 1996; Hong 2000;
Anderson and Danthine 1993).

What distinguishes this literature from the IPE literature is the general paucity of
context, political or otherwise, and the audience to which it is directed. There usually are
no explicit links made to policy, history, politics, business culture, or global financial and
productive structures, even though much of this scholarship bears upon such discussions
in often important ways. Further, the technical writing seems directed at a very limited
audience, namely academics, hedge fund managers, corporate risk managers and the like.
By contrast, the examination of derivatives in this dissertation makes no pretense of
ignoring traditional political economy concerns (like income distribution), places
derivatives into their social and historical context, and aims to be of practical use of
policymakers in the developing world.

The technical literature is complemented by a rather broad microeconomic and
sectoral literature authored almost exclusively by economists dealing with the application
of futures and options markets to agricultural problems (namely price and weather risks).
The late 1970s and early 1980s witnessed a wave of policy-oriented research on
derivatives markets almost all of which was intended to undermine the agricultural policy
regimes operating at that time. As early as 1967, McKinnon contrasted the inefficiencies
of government buffer stock programs with more efficient “distant futures markets”.
Christopher Gilbert, whose work in the sub-field spans almost three decades, concluded
that there was no welfare benefit to commodity price stabilization schemes given the existence of efficient futures markets (1985).

As the years progressed such favorable studies of futures markets came into the mainstream, roughly coinciding with the collapse of the last international commodity agreement that was widely seen to have achieved its goals, the ICA. By 1993, Claessens and Duncan were thus able to write about the failure of public stabilization and the “emergence of a host of new financial instruments and financing techniques” including derivatives. World Bank and other researchers have continued along this path, simultaneously pointing to the failure of public stabilization and offering derivatives-based alternatives (e.g. Varangis and Larson 1996; Larson, Varangis and Yabuki 1998; Varangis, Larson and Anderson 2000; Gardner 2000; Rabobank 2004; Bohman et. al. 1996).

As will also be noted below, this technical, microeconomic literature is marked by a generally favorable verdict about the capacity of futures markets to protect farmers from price risk. Almost always, contributors to this literature extol the ability of derivatives to promote efficiency, policy coherence and producer freedom. And almost always, the analyses undertaken utilize sets of assumptions that limit the practical applicability of the authors’ findings (e.g. assumptions as to efficient markets in which prices instantly reflect new information and that farm-level output levels are certain). My analysis departs from such treatments along several dimensions. I use different evaluative criterion, pay close attention to the assumptions that I make, and exhibit some skepticism regarding derivatives’ applications to developing country agricultural policy.
Of course, there are exceptions to these broad trends in the technical, microeconomic literature. Rolfo (1980), Gardner (1989) and Lence and Hayenga (2001) have cast serious doubt upon the ability of producers to hedge under conditions of yield uncertainty and the ability of rollover hedging to provide for farmer income stability. Where relevant, the contributions of such authors will be incorporated into my own analysis.

**The global coffee economy**

Three different categories of research about coffee bear on the dissertation. First, research about the structure of global coffee production and trade maps the changing social, economic and political terrain upon which coffee farmers go about their business. Second, research into coffee crises (generally described as prolonged periods of low prices) highlights the importance of prices for farmer income and well-being. It also describes how farmers are actually dealing with such risk using first-hand information gleaned via field research. And, third, research into the present and historical arrangements and techniques used to manage coffee price risk catalogues the nature of price risk management arrangements, their historical context, and frequently evaluates their successes or failures on various grounds.

Taken together, the following stylized facts emerge, all of which foreground and inform this investigation:

1. Coffee farming is a risky business where the risk of low or volatile prices is of special importance to producers.

2. Absent effective risk management tools, such price changes are ruinous and result in declining incomes and standards of living for coffee farmers and their families.
3. Coffee price risk management has become more important since coffee market liberalization, but it has also become more difficult due to the disappearance of institutions that previously helped to manage such risk.

4. Historical and current practice gives researchers and policymakers various coffee price risk management arrangements to evaluate and consider in this context.

Most discussions of coffee farmers and the price risks they face begin by noting that the economic and political terrain upon which farmers act has changed over the past several decades. These changes have contributed to greater levels of price volatility and diminished farmer capacity to manage it. For example, Lewin et al. (2004) writing for the World Bank note that, of the 25 million or so coffee farmers around the world, “a number of them are facing considerable difficulties because of the dramatic decline in the price of coffee to 100-year lows in real terms (2004, xi).” They argue that while coffee price risk has always been a real concern for farmers, today the situation may be more dire because of significant “structural changes” in the global coffee market (2004, xi-xv).

Global supply has increased, thanks to expanded production by Brazil and Vietnam. Coffee roasters, retailers and manufacturers have responded to supply, quality and price dynamics by increasingly substituting inferior and cheaper coffees (Robustas) for higher quality and more expensive types (Arabicas). Farmers are capturing a smaller share of retail prices thanks to low export prices and the power of these corporate coffee consumers. Indeed, “Many countries perceive the commodity trading system to be

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7 Corporate power is one factor that contributes to low prices for farmers. While oversupply ensures that export prices remain relatively low, power inequities often prevent farmers from negotiating for a larger share of retail prices. Increasingly, the final coffee product is de-linked from green coffee markets as corporate retailers spend more time differentiating their product via packaging, marketing, and creating
increasingly onerous… (2004, xii).” That the global coffee market has become more volatile, more competitive and subject to major structural changes over the past several decades has been widely noted by a whole host of scholars and institutions (see, e.g., Baffes 2005; Charveriat 2001; Daviron 2005; Eakin 2006; FAO 2004; Gibbon 2005; Gilbert 2005; Gresser 2002; Menon 2005; Pereira 2004; Wild 2004). The implication of such changes for coffee farmers has been that coffee price volatility is more severe today (and if not more severe, at least farmers are more exposed to it—see Gilbert 2005), and that farmers often lack the means to effectively manage price risk.

Structural changes in global coffee markets are similarly acknowledged by political economists writing about the institutions that have governed coffee prices in the past. Bates (1997), whose political economy of coffee is considered to be a seminal work in the field, studies the ICA that existed between 1962-1989. Bates contributes to what he calls “open-economy politics”, a research program that views international politics “not only as the outcome of relations among states, but of the interaction between domestic and international games and coalitions that span national boundaries” (1997, 3). While he focuses predominantly on the politics of creating and sustaining an international coffee-governing institution, Bates devotes significant time to describing the manner in which the ICA served to change the structure of the global coffee market. He notes particularly (3-25) that the ICA’s quota scheme served to fix export and import levels (and thus also global coffee supplies), to fix price differentials between different kinds of café-like environments. This allowed for the generation of different price dynamics in each market. For example, during the recent coffee crisis the retail price of (roasted, brewed) coffee remained relatively constant while green coffee prices collapsed. Farmers are not sufficiently powerful relative to large corporate actors further down the chain to appropriate a larger portion of the retail price.
coffee, and to fix the distribution of coffee income between producing and consuming countries. As noted by many other scholars, these ‘fixities’ have shifted and changed since the dissolution of the ICA’s quota mechanism in 1989, with price volatility, falling income shares, and heightened competition among the implications for farmers. Talbott (2004) makes many of the same observations as Bates.

Likewise, researchers like Ponte (2002), Talbot (1997) and Raynolds (2002) have mapped structural changes in the coffee market, incorporating a specific focus upon power, control and inequality. Ponte suggests that since the collapse of the ICA, the power of coffee consumers (like roasters and manufacturers) has increased at the expense of coffee farmer power, leading to a situation in which farmers are increasingly helpless to address low and volatile prices and incomes. Talbot (1997) similarly argues that Latin American producers of instant coffee have earned less income from exporting their product than have large multinationals (a gap that has widened since liberalization in the 1980s), largely because of the control that multinationals exert over the production process. The ability of producers to raise and stabilize prices (i.e. to redistribute coffee income in their favor), a power institutionalized in the ICA framework in Ponte’s case, has given way to a market-based system of “negotiation” dominated by big multinational players in which producers have little say about price levels and income distributions (see Ponte 2002, 1112-13).

Complementing research into coffee market structure (and the implications thereof for prices, incomes, power, and inequality), a growing body of empirical work seeks to understand how individual farmers and coffee communities are dealing with these changing conditions. This empirical and case-study research, frequently conducted by
anthropologists and economic geographers, can be seen as providing individual and community portraits of the structural changes depicted in the literature above.

Much of this literature arose during and after the 1998-2002 coffee crisis. Relying on interviews and farm-level surveys, various studies confirm the significance of price risk for coffee farmer income and well-being and also, unfortunately, confirm the poverty of risk management strategies available to most (especially small) farmers. Eakin et al. (2006) conducted interviews and surveys of coffee farmers in Mexico, Guatemala and Honduras, while Sick (1997) presents similar work on the 1989-1992 coffee crisis in Costa Rica. The World Bank (2005) undertook similar studies in Central America. Watson and Anchinelli (2008) discuss the situation of small coffee producers in Brazil. Oxfam researchers conducted interviews with coffee producers in Latin America and in Sub-Saharan Africa (Gresser and Tickell 2002; Charveriat 2001; Sayer 2002; see also Thiele, et. al. 2006 for non-Oxfam research on Uganda and the coffee crisis).

The changing structure of the global coffee economy and the recent hardships of producers have resulted in a small but growing literature on arrangements that might protect farmers from low and volatile prices. Mohan (2007) discusses the potential for options markets to provide farmers with relatively cheap price insurance, but stops short of providing empirical evidence about what options trading can precisely accomplish in regard to farmer well being. Raynolds (2002), Calo and Wise (2005) and Bacon (2004) are among several researchers interested in the potential for Fair Trade and other “niche” markets to act as anti-poverty and sustainable development mechanisms. Oxfam has suggested a return to the era of managed coffee supplies, as well as new policies to support farm diversification (Gresser and Tickell 2001, Charveriat 2002).
My investigation uses this literature in several ways. Research on the structure of the global coffee economy constitutes background for my analysis. It also contributes to my assessment of income inequality (more on this below) and my descriptions of new institutions to connect farmers to futures markets (especially commodity chain analyses which provide an excellent map of the global coffee economy). Field research as to how farmers are managing price risk also figures prominently into my discussion of income security alternatives. Research that reveals the consequences of low and volatile prices for farmer well-being also informs various parts of the investigation. Perhaps most importantly, my investigation is a contribution to the debate about how farmers might manage the risk of low and volatile prices. I undertake to illustrate whether and to what extent futures markets might provide such security.

**Derivative instruments and agricultural development**

Last, a new and growing literature on the potential role of derivative instruments in developing country agricultural sectors borrows from and overlaps with both the derivatives and coffee literatures. Originating mainly with international development institutions and non-profit organizations, this literature is designed to be of practical use to agricultural policymakers in developing countries. As such, the reports, memoranda and issue briefs that dominate this literature detail the specific uses to which derivatives might be put and the specific goals that such instruments might help to achieve in the broader agricultural context and in the narrower coffee context.

My investigation is a contribution to this burgeoning policy debate insofar as it empirically measures the income support that derivatives can (and cannot) provide to coffee farmers and critically reflects upon the implications of these findings for coffee
and agricultural policy in the developing world. I also employ many of the recommendations found in this literature as objects against which I frame my empirical findings, explore their implications and develop new policy recommendations. Below I delineate and critique four common conceptual threads that run through this body of work.

First, the literature on derivatives and agricultural development overwhelmingly implies that such markets can be a mechanism for the socio-economic uplift of farmers. In particular, it is generally argued that derivative instruments like futures and options can be used to secure farmer incomes in the face of volatile and crisis-prone agricultural commodity markets (e.g. ITF 2006; Varangis, Larson and Anderson 2002; Rabobank 2004; Brown, et. al. 2008; World Bank 2008; Larson, Varangis and Yabuki 1998; Varangis and Larson 1996; Claessens and Duncan 1993; UNCTAD 2007; UNCTAD 1998; FAO 2007; Gardner 2000; Mohan 2007; Rutten and Youssef 2007; Akiyama, et. al. 2001).

Notwithstanding this generally positive verdict, the literature lacks clarity as to what precisely derivatives can do in regard to farmer incomes. For example, several researchers wrote recently that: “It is important to note that market-based tools offer income predictability, not necessarily income stability… (Brown et. al. 2008, 22).” However, the ITF argues that derivatives markets can indeed stabilize incomes: “The market-based risk management instruments can smooth income fluctuations and provide protection from short-term price falls internationally (ITF 2006, 2).” Still others imply that futures markets could be vehicles for raising farmer incomes (Dodd 2007) and improving farmers’ relative income position (e.g. Rutten and Youssef 2007, 4). Despite
assertions like these, researchers have thus far failed to pose and answer the following question: “What exactly can derivatives markets do for the incomes of farmers?” The apparent confusion on this matter suggests the crucial importance of figuring out precisely what these instruments are and are not capable of in relation to producer incomes.

Second, researchers have also begun to discuss specific ways in which small producers, who tend to have difficulty accessing derivatives markets, might be effectively ‘linked up’ to them (ITF 2006; Rabobank 2004; Rutten and Youssef 2007; UNCTAD 2002). The World Bank’s ITF was created specifically for this purpose. Despite the apparent eagerness among researchers to forge ahead and create intermediaries or other solutions to the access problem, the nature of the problems themselves are given scant attention. Tellingly, a 70+ page document from the World Bank entitled “Dealing with commodity price volatility in developing countries” devotes one half of one page to “the nature of the market gap” (1999, 4). In addition to being rather brief, this section does not address problems producers have in accessing futures markets at all. It instead focuses entirely upon the problems financial firms in the developed world face when trying to serve developing country actors.

As another example, Varangis, Larson and Anderson, who do a bit better on this issue than the World Bank did above, note: “The major challenge of the ITF work is to find a local institution that can capably aggregate enough volume from many small farmers to access the international market for risk management instruments (2002, 14).” But, what is the extent of this aggregation problem for small farmers? Does it differ across countries? Could there be additional access obstacles aside from aggregation?
How big and expensive is the task that confronts organizations like the ITF? These questions are also rarely, if ever, posed.

Third, and related to the second point above, researchers tend to take for granted that policymakers should be spending their time and resources fixing aggregation and like access problems. For example, a 1998 Expert Meeting of UNCTAD’s Commission on Trade in Goods, Services and Commodities yielded the following: “The Expert Meeting agreed on the need for a comprehensive approach to enhance the understanding and use of commodity price risk management and collateralized finance (UNCTAD 1998, 2).”

As another example, the 2008 World Development Report suggests that governments in the developing world should consider the development of domestic futures exchanges and “train firms [specifically farmers] on use of market instruments to hedge risk” (World Bank 2008, 128).

While this may indeed be a good use of public and private resources, it seems sensible to withhold such recommendations until a bit more is known—i.e. the precise benefits to farmers of participating in derivatives markets and the nature and scale of access problems to be surmounted. As will be seen, providing for farmer access involves much more than “training” and the benefits of such efforts for farmers are far from clear.

Lastly, the literature on derivatives and development is replete with discussions of alternatives, market-based and otherwise, that also may work to shore up farmer incomes in the face of commodity price volatility. Yet, this listing of alternatives is all too often just that—a list (e.g. Charveriat 2001; Gresser and Tickell 2002; Daniels and Petchers 2005; Rutten and Youssef 2007; Brown et. al. 2008; Varangis, Larson and Anderson 2002). Researchers rarely comment on how policymakers might pick and choose
among alternatives, which criteria may be helpful, and how different alternatives appear better or worse depending on particular policy goal(s). A menu of options can only be so useful—at some point difficult decisions must be made.

I intend this investigation to be a critical intervention into this policy debate. In the pages that follow, I attempt to illustrate what exactly derivative instruments, futures specifically, can do for farmer incomes. I describe and explore the nature and severity of the futures market access problems that confront farmers. And I question the policy wisdom of so many researchers to date. In particular, I discuss whether or not policymakers ought to pursue futures markets in the agricultural development context, to what degree, and how policymakers might usefully sort through various alternatives to dealing with the impact of commodity price volatility on farmer incomes.

I ask the reader to keep in mind those questions that I have raised in this last subsection, for they are brought to bear again towards the end of the chapter.

The next section details the method and principles that structure the investigation.

**Method**

The behavior of coffee prices is a significant contributor to the well-being of coffee farmers. This recognition resulted in multiple attempts by governments to manipulate and manage coffee prices beginning in the early 20th century. While such attempts were designed to achieve a variety of ends, ensuring the well-being of producers has always been among them. The Brazilian government’s “permanent defense of coffee” began in the early part of the 20th century, giving way to the ICA in the early 1960s, with various other schemes punctuating the time in between. These arrangements sought to stabilize
and augment coffee prices via manipulation of coffee supplies. All had in common a central role for governments in facilitating and administering supply management.

In 1989 the ICA collapsed under national and international political and economic pressures and brought the era of government intervention in world coffee stocks to an end (see discussion in Chapter 3). Coffee market liberalization has resulted in renewed concern about the behavior of coffee prices and their impact on coffee farmer well being, a concern fueled by two coffee price crises since 1989. Prices plummeted precipitously in the early 1990s as supplies previously stored by national governments were released onto the world market. Then in late 1997 coffee prices again started to fall and by 2002 had reached their lowest real levels in one hundred years.

Against this backdrop researchers have begun suggesting new sorts of arrangements that might replace the public commodity price stabilization schemes of the past. These include derivatives markets (specifically futures and options markets), Fair Trade networks, and on- and off-farm diversification. There have also been calls to return to the government-managed markets of the past. Amidst this cacophony it is important to investigate the actual impact that each of these arrangements might have on the well-being of coffee farmers. This project contributes to this broad inquiry by investigating the role futures markets might play in protecting farmers, especially small farmers, from threats posed to their well-being by coffee price volatility. Specifically, the dissertation asks and answers the following question: *To what extent do futures markets provide for the income security of small coffee farmers? And, what does this imply for policy?*

Below I elaborate upon and justify this research program. The first and second sections below justify and explain my focus upon income security in the coffee context.
The third section justifies and explains my particular focus on small producers throughout much of the dissertation. The fourth section discusses and justifies my case selection. In the fifth section I outline my specific research methodology, including the nature and sources of the data I employ. The sixth and final section provides an outline of the rest of the dissertation.

**Why income security?**

Previous analyses of futures markets in the agricultural commodity context have utilized various evaluative criteria. On the basis of *efficiency* many economists have recommended futures markets as a superior alternative to public commodity price stabilization (e.g. Claessens and Duncan 1993; Larson, Varangis and Yabuki 1998). Suggestions that futures markets are more conducive to individual *freedom* of choice have similarly recommended them to many scholars (e.g. Newberry and Stiglitz 1981; McKinnon 1967). Some have suggested that futures markets ‘*fit in*’ with the broader agenda of agricultural liberalization in the developing world, making them desirable for policy coherence reasons (e.g. ITF 2006c; UNCTAD 1998b). More generally, market-based solutions to the ‘price problem’ are often portrayed as occupying a *moral* high ground insofar as they undermine government paternalism and foster the virtues of self-reliance and individual responsibility (e.g. Freidman 1954; Marsland 1995). Among other interesting similarities⁸, all four of these evaluative approaches have yielded a

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⁸ Also similar is the ideological base that underpins the four evaluative criteria mentioned above. Pioneered by prominent economic liberals, such approaches are normatively grounded by several well-known precepts of the current economic orthodoxy, including: a deep skepticism of government intervention in the economy for reasons of both efficiency and freedom; freedom interpreted as formal freedom of *choice or opportunity* (as opposed to the substantive freedom to “be and do well” in Amartya Sen’s parlance); and, the belief that free markets are the best way to organize human (economic) activity.
favorable outlook regarding the potential for futures markets to improve farmer well being.

While all of these criteria are at least tangential (and often directly related) to the well being of coffee farmers, I adopt a criterion that concerns itself explicitly with farmer *incomes*. For all of the enormous literature on derivatives, a systematic income-based analysis of futures markets is conspicuously absent in analyses of coffee markets and in the literature on developing country agriculture more broadly. UNCTAD recently raised this concern:

There is much literature on the benefits of price risk management for large corporates – for these firms, managing risk is not a “zero-sum” game, but rather improves their net worth. There is much less literature on the benefits of price risk management for farmers’ wealth. What would be the impact of enabling farmers to lay off part of their risks through the use of market-based instruments? (2002, 7)

Implicit in my framework is the notion that one mechanism by which price behavior is converted into farmer well being is through the impact of coffee prices on the incomes of coffee farmers. The 1998-2002 coffee crisis illustrated this mechanism in stark relief. Among many others, Ponte (2002), Gresser and Tickell (2002), Charveriat (2001) and Wild (2004) indicate that the coffee price problem has led to several related *income problems* for farmers. Not only did the crisis *destabilize* incomes and make them more *uncertain*, but it also resulted in *falling* incomes and incomes becoming more *unequal*. Income inequality has become especially evident between coffee farmers and other actors along the coffee commodity chain like roasters and manufacturers.

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9 Income from farming is thought to be largely determined by *price* effects and *quantity* effects. That said, some scholars have emphasized the importance of *power* in determining the contours of price dynamics. See, e.g., Ponte 2002.
Speaking to both destabilized and falling incomes, Gresser and Tickell write:

Developing-country coffee farmers, the majority of whom are poor smallholders, now sell their coffee beans for much less than they cost to produce. The coffee crisis is becoming a development disaster whose impact will be felt for a long time. Families dependent on money generated by coffee are pulling their children, particularly girls, out of school, can no longer afford basic medicines, and are cutting back on food.

Hallam notes that short-term income uncertainty has resulted in farmer reductions in “application of inputs including labour”, which has “[created] unemployment and “[stimulated] migration”. The ITF (2002) and Bigirwa (2005) make similar findings in Mexico and Uganda, respectively (reduced input application has the backhanded effect of reducing future income as productivity declines).

Charveriat (2001) cynically remarks on the record-breaking profits of coffee roasters and retailers like Nestlé and Starbucks during the crisis. Gresser and Tickell write that such coffee corporates are “laughing all the way to the bank” in the midst of producer misery (2002, 2). Ponte (2002) discusses at length the manner in which coffee market liberalization has generated power inequities in the coffee market that result in a highly unequal distribution of income along the global coffee commodity chain (GCCC).

Despite (overwhelming) evidence as to the multidimensional nature of the farmer income problem, the existing scholarly literature on market-based price risk management (i.e. derivatives markets) tends to focus on only one: the capacity of derivatives markets to allow for income stabilization (i.e. smoothing). Seminal works on the subject, like Newberry and Stiglitz’s Theory of Commodity Price Stabilization (1981), discuss the problem in terms of income “variability” only. In this manner a multifaceted problem—call it income insecurity—is reduced to a matter of mere stability. Also problematic in
the standard literature is the manner in which income stability is conflated with income certainty. While the two are certainly related, I will argue in subsequent chapters that it is useful to view them separately. These matters are also discussed at more length below.

This is not to say that income stability is not an important component of farmer income security. Rather, I mean to say that it is not the only income problem that confronts coffee farmers in the context of price behavior. Indeed, policies to address the producer income problem, via derivatives or otherwise, cannot merely focus on developing and implementing mechanisms to stabilize and predict incomes. As the above scholars suggest, incomes during the crisis were (and largely still are) also inadequate to cover expenditures on food, medicine and school fees. What’s more, farmer incomes were (and largely still are) very low relative to the overwhelming successes of multinational coffee corporations during the same time period.

I thus adopt a more robust notion of ‘income security’ that incorporates four different considerations, capturing the complexity of the producer income problem: stability, certainty, adequacy and (in)equality. This multidimensional notion of income security is the criterion that I use to gauge the performance of coffee futures markets. A recent statement by the International Labor Organization (ILO) partially informs this conception: “Income security consists of an adequate level of income, a reasonable assurance that such an income is fair, relative to actual and perceived “needs” and relative to the income of others, and the assurance of compensation or support in the
eventuality of a shock or crisis affecting income (2004, 55).” Note, however, that while the ILO is concerned with income “fairness”, I explore the matter of income inequality. I would like the reader to note the following in regard to the producer income problem. As noted above, existing research suggests that the problem is multidimensional, spanning concerns about stability, certainty, adequacy and inequality. That said, it is not necessarily the case that researchers and development institutions argue that farm-level use of derivatives instruments can address all of these income-related concerns. As was seen above in the review of the literature on derivatives and agricultural development, researchers differ in their evaluations of the extent to which derivative instruments can be used to address the producer income problem and/or various dimensions thereof. Part of the aim of this investigation is to generate data and empirical conclusions that help sort out precisely what it is that derivatives can and cannot do relative to producer incomes, i.e. to measure the congruence between the producer income problem and one possible solution to that problem.

**Farmer and family well-being**

The project is generally informed by the idea that income security is an important contributor to the well-being of coffee farmers and their families. Like the relationship between income and poverty, the relationship between income and well-being is complex and non-linear. Development scholars like Amartya Sen have added the concept of ‘freedom’ to this nexus, creating a locus between income, well-being, freedom and poverty. Even though this investigation’s focus lies elsewhere, it seems important to

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10 The ILO is understandably cautious in its treatment of “need” in the above definition of income security, seemingly recognizing that “need” is a nebulous term and that needs can vary among individuals, groups, communities, and nations.
foreground my later discussions of well-being with an acknowledgement of the debate that surrounds the concept.

Amartya Sen’s capabilities approach formulates the problem of poverty as one of unfreedom. Development is thus the process by which every individual becomes equally free “to lead the kind of lives they have reason to value” (Sen 1999, 10). Freedom is conceived of both instrumentally (e.g. political freedom might be a means to economic freedom and vice versa) and as an end in itself.

One important dimension of freedom is the freedom to be well. Sen treats well-being in the language of “functionings”. He writes: “The well-being of a person can be seen in terms of the quality (the ‘well-ness’, as it were) of the person’s being. Living may be seen as consisting of a set of interrelated ‘functionings’, consisting of beings and doings…The claim is that functionings are constitutive of a person’s being, and an evaluation of well-being has to take the form of an assessment of these constitutive elements (1992, 39).” Functionings include such beings and doings as being adequately nourished, being in good health and “more complex achievements such as being happy, having self-respect, taking part in the life of the community and so on” (Sen 1992, 39). Well-being thus comprises both material and non-material achievements.

However, the specific functionings that a given individual may value vary widely. Sen refrains from specifying those components of well-being that should be valued by any given individual (for this would violate his freedom) and it is for this reason that he focuses upon the freedom to be and do well. All should be equally capable of living a self-valued life, whatever the content of that life may be. Furthermore, Sen also contends that well-being is not the only object of freedom: “But a person can—and typically
does—also have other goals and values than the pursuit of one’s own well-being (1992, 56).”

Income figures into this picture instrumentally. Income is a tool with which individuals can achieve various functionings (although it is not the only tool that may be necessary), and is thus a tool for the achievement of well-being. Income insecurity can (but does not always) lead to reductions in well-being. “The usefulness of wealth lies in the things that it allows us to do—the substantive freedom it helps us to achieve (Sen 1999, 14).” Income is the partial base upon which substantive freedom rests. If substantive freedom is the freedom to be and do well, and well-being is at least partially achieved with income, then income security is an ally of substantive freedom. In this ideological tradition (as with the Marxists), freedom and economic security are complementary, with the former providing the basis for the latter and the latter reinforcing the former. Sen’s formulation is echoed in a recent ILO statement, which notes that policymakers in developing countries after the Great Depression saw economic security as a means to and an end of ‘development’—“the means and the ends were twins” (2004, 19). The idea of substantive freedom is very different from the freedom of choice that informs previous analyses of futures markets (see above).

My analysis incorporates many of these concepts and relationships. I refer throughout to the “well being” of the coffee farmer and family. I refrain from stipulating the full set of goods and services that families ‘want’ or ‘need’. Yet, I discuss certain items, such as food, medical expenses and school fees, that are reasonably seen to be
important for a farmer and her family. I thus try to combine respect for individual autonomy with a practical need to specify at times what families might actually do with their incomes. The tension here between theoretical impossibilities and practical necessities comes up again below in the discussion of needs-based sustainable development.

**Pro-poor and pro-small risk management: a needs-based approach to development**

John Rawls’ difference principle argues that social arrangements that generate inequality are fair (just) only if the least advantaged benefit most from them (in DeMartino 2000, 93). This ethical precept has been rearticulated by development scholars as a “needs-based approach to sustainable development”. This perspective “places a priority on helping the poorest members of society out of systemic poverty (Potts 2003, 6).” This is a tricky business, for who are the poor?

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11 The evidence I present is suggestive of the consequences of income insecurity for farmer well-being, though I do not mean for it to be conclusive (this would require a person-by-person survey updated continuously as circumstances change, and even this would fail to capture many of the intangible components of well-being). Every farmer and family is different, with different personalities, traits, needs, wants, cultures, social, environmental and political conditions, and so on. The particular impact of income insecurity on well-being would thus vary from person to person.

Further, most of the evidence I present on the relationship between income and well-being throughout Chapters 4-6 further pertains only to material well-being. This is not meant to detract from the importance of intangible components of well-being like happiness or self-respect or participation in the life of the community. Rather, the focus reflects dominant foci in the existing literatures from which I draw the evidence. The literature on capital rationing, for example, discusses productive investments in the farm forgone when incomes fall and does not discuss the psychological impact failing family farms. Further, a comprehensive fleshing out of all potential relations between income and well-being of various types is beyond the scope of the investigation. The reader should be aware that income insecurity is likely to have serious and important implications for these intangible components.

12 This tension is an expected byproduct of my method. I intend this dissertation to be of scholarly quality, content and form, and of practical relevance—goals that often appear irreconcilable. It is unsurprising that theory and practice are somewhat hostile to one another in various places throughout. I am of the opinion that such tensions should be explored and accounted for, but that they should not induce paralysis in the cautious application of theory to practice.
Indeed, what is so difficult to specify in theory is often much easier to point to in practice—to some extent we know poverty when we see it. This is what Dr. King suggested in the epigraph of this chapter—he had “seen” poverty and knew it to be so. It was presumably this practical ease that led researchers at Oxfam to note that “developing-country coffee farmers” are “mostly poor smallholders” (Gresser and Tickell 2002, 6). Small coffee farmers tend to be poor. This is not because farm size is necessarily an indication of poverty. Rather, given the structure of today’s relatively liberalized global economy, small size is a serious disadvantage and often serves as an indicator of economic distress and capabilities deprivation.

Several different structural considerations are relevant here. While there are minimal economies of scale in coffee production (with the big exception of Brazil where coffee harvesting is mechanized to a large degree conferring an advantage on larger producers), there are economies of scale in other activities along the GCCC. Roasters, manufacturers and retailers, increasingly involved in product advertising, packaging and branding, are subject to sizeable economies of scale (these activities also increase their leverage in dealing with retailers—see Gresser and Tickell 2002). Providers of agricultural inputs, especially chemical fertilizers and pesticides, are also subject to considerable economies of scale. These market imperatives have resulted in very concentrated market structures that bracket the coffee producer on either side (see, e.g. Ponte 2002; Dicum and Luttinger 1999; Wild 2004; Gresser and Tickell 2002). Thus, the “price-taking” coffee farmer (producing in a relatively competitive marketplace) is squeezed from both ends as input prices rise and retail coffee profits are not passed upstream back to the producer. In the relatively free global coffee market, relative size is an indication of market power.
Furthermore, the frequently local-level operations of coffee producers exist in stark contrast to the multinational character of the big coffee corporations (which at least partially reflects the imperatives of scale economies)—Nestlé, Kraft, Sara Lee, Procter & Gamble, Volcafé, etc. Gresser and Tickell note that for companies such as these, “In the free market their global reach gives them unprecedented options (2002, 6).” The literature on multinational corporations (MNCs) broadly confirms the competitive advantages of being ‘global’ (e.g., Dicken 2007). Dicken writes of the agro-food industry: “Producing food for a global market requires huge capital investment and gives immense power to the transnational food producers and the big retailers (2007, 348).”

While in the past the ICA meant that governments stood in for producers at the bargaining table, today no such counterbalance to corporate power exists. Ponte comments on this power shift (a consequence of market liberalization) and its implications for the viability of small coffee farms: “From a fairly balanced contest between producers and consumers within the politics of the commodity agreement, market relations shifted to a dominance of consuming country based operators (including their agents based in producing countries) over farmers, local traders and producing country governments. This has been accompanied by lower and more volatile coffee prices, a higher proportion of the income generated in the chain retained in consuming countries, and a declining level of producer held stocks (2002, 1105).” Coffee farmers told Oxfam in interviews during the recent coffee crisis that they had no choice but to accept the prices offered by international traders as they had no power to negotiate (Gresser and Tickell 2002, 21).
Moreover, although coffee production itself does not afford much of an advantage to the larger farmer (except in Brazil), many input and other markets ancillary to production do exhibit this tendency. Large and very large farms tend to enjoy preferential access to loans due to economies of scale in transaction and monitoring costs, and larger output levels (World Bank 2005a; Dicum and Luttinger 1999). Small farmers are also disadvantaged in terms of transport costs. With poor transportation infrastructure and no personal vehicles, they are frequently left to sell their coffee at the farmgate at a steep discount and always with the chance of being defrauded by middlemen (Dicum and Luttinger 1999; Charveriat 2001; Sayer 2002). As will be seen, larger farmers also have an advantage in terms of accessing futures markets and other means of risk management.

All of this is to say that in today’s global coffee market, ‘small’ tends to equate to ‘poor’. Recently a workshop was convened in the UK, with participants from academic, non-profit, governmental and small farming communities, for the purpose of discussing the conditions confronting small farmers in an era of neoliberal globalization. While recognizing the enormous diversity of “values, beliefs, practices and ways of thinking” among small farmers around the globe, workshop participants nonetheless homed in upon certain commonalities across the global North and South.

As I have also tried to argue, several workshop participants write about the linkages between “small” and “poor” in the global agricultural context: “Problems of poverty, 13 I have focused here on the disadvantages of being small in the global coffee market and how this contributes to the poverty of coffee farmers. But, it seems that this connection runs in the other direction as well—poverty limits the ability of coffee farmers improve productivity (via new techniques, inputs, etc), to diversify their operations into other higher-income activities both within and outside of the coffee sector, and so on. There are also some notable advantages to being small, in particular the tendency of small coffee farms to utilize traditional farming techniques that focus upon environmental preservation and stewardship (Dicum and Luttinger 1999). Yet, these important social contributions (positive externalities) are not reflected in the price of coffee at the farmgate.
marginalisation and disempowerment connected to processes of globalization have resulted in small-scale farmers in both the North and South becoming the weakest players in the global market (Stringer, Twyman and Gibbs 2008, 238).” Participants further pointed to many of the same structural issues that I discuss above: “[I]n both the South and North a profit bottleneck occurs between the farmer and the consumer, at which point profits and benefits are concentrated. According to workshop participants, the single largest stress affecting smallscale farmers in both the South and North is poverty as a result of globalised markets and supermarket/TNC power (Stringer, Twyman and Gibbs 2008, 242).”

This link between smallness and poverty is not a hard and fast rule, but a tendency. It is this connection that informs my disproportionate focus upon smaller producers and throughout I analyze futures markets from this perspective. The main point I wish to make is that in a liberalized coffee market setting small farmers are among those groups that appear to be most disadvantaged, desperate and deprived (agricultural laborers and small, local millers are also among the most disadvantaged). A needs based approach to sustainable development suggests that policies aimed at assisting this community are ethically preferable to ones that do not. Furthermore, policies that confer additional hardship and disadvantage upon this community ought to be rejected outright.

In the next section I discuss the three case countries selected for the analysis.

Case selection

This dissertation thus seeks to analyze futures markets through the dual lenses of income security and small producers. My examination is further focused upon three country cases: Mexico, Brazil and Uganda. Below I discuss and justify this selection.
Generally, these three country cases were chosen because of the variety that they lend to the investigation. Across the three both major varieties of coffee are produced (Arabica and Robusta) on three continents (North America, South America and Africa). Further, coffee farmers from each country (would) hedge on a different derivatives exchange: the Intercontinental Exchange (ICE) for Mexico; the Bolso de Mercados y Futuros (BM&F) for Brazil; and the London International Financial Futures and Options Exchange (LIFFE) for Uganda). If these differences contribute to very different results, this will be an important finding insofar as the income security contributions of futures markets are case-specific. If results across cases are similar in spite of these differences, this will also be an important finding that may allow for some limited generalization.

Brazil is a least-likely case. By this I mean to say that futures markets are likely more viable in income security terms for a larger proportion of the coffee farming population in Brazil than in any other coffee-producing country. Brazil is an outlier in the global coffee market. Brazilian coffee farms are some of the largest in the world, suggesting that futures market access problems (more below) will be least severe here. Moreover, the Brazilian government devotes large amounts of public funding to agriculture relative to other developing countries suggesting that programs to intermediate between farmers and futures markets (more below) may be more successful here than elsewhere.

Further, Brazilian farmers have access to a domestic derivatives exchange. Depending on one’s view of the relationship between speculative activity and the volatility of future prices, a domestic exchange may imply fewer speculators relative to the more global exchanges in the advanced economies and thus less volatile future prices.
This would suggest that hedging on the Brazilian futures exchange may do more for farmer incomes than would hedging on the global exchanges. Last, Brazilian farmers appeared to be the least negatively affected by the recent 1998-2002 coffee crisis in which prices declined sharply. These are factors that may combine to make the results of the Brazilian study relatively inapplicable to the situations of farmers in other coffee producing countries—it is a least likely case.

On the other hand, Mexico and Uganda are most-likely cases, the choices of which were somewhat arbitrary. By this I mean that the experiences of coffee farmers with futures markets in these two countries are likely very similar to those that would prevail in most any other coffee producing country.

Indeed, Mexico and Uganda parallel the conditions in other coffee producing countries in a variety of respects. As in most coffee-producing countries, most coffee farmers in Mexico and Uganda are small farmers. Like virtually all Latin American producers, Mexican farmers grow mainly Arabica coffee and would hedge their output on ICE. Like many Sub-Saharan African producers, Ugandan farmers grow mainly Robusta coffee and would hedge their output on LIFFE. Research on the recent coffee crisis has drawn parallels between the experiences of small producers across most of Latin America (e.g. Eakin 2006; World Bank 2005b). Similar parallels were made across African producing countries (e.g. Charveriat 2001; Gresser and Tickell 2002). This research is collectively suggestive about the types of income security options that coffee farmers across these regions enjoy.

Instead of choosing Mexico, I could have easily decided upon Costa Rica or El Salvador or Guatemala. Instead of choosing Uganda, I could have easily decided upon
Tanzania or Cote D’Ivoire or Cameroon. Yet it is precisely this arbitrariness that is important. For the results of these case studies may speak to the situations of farmers in other producing countries. In particular, matters of farm size, future price movements and alternative income security arrangements (to futures markets) are likely (but not certain) to be problematic in other coffee-producing countries if they are so in Mexico and Uganda.

I would also like to note that these three countries are all least-likely cases in one important respect. All three have (or had) in place institutions/programs to intermediate between farmers and futures markets (i.e. to bridge access problems). That institutional forms vary across the three cases is an additional source of inter-case variety. However, the majority of coffee producing countries (over 50 in all) do not have such intermediaries in place. Insofar as access problems might be remedied by such institutions, the three case countries I have chosen are somewhat different than many of those that remain.

In the next section I sketch step-by-step how the investigation proceeds.

**Futures markets and coffee farmer income security: An exploration in three parts**

In order to ascertain the contributions that futures markets might make to the income security of small coffee farmers I undertake a three part investigation within three particular country contexts. Each part of the inquiry utilizes a different methodology, yet all three parts are geared towards explicating the initial research question: to what extent do futures markets provide for the income security of small coffee farmers? I make use of quantitative, qualitative, and theoretical analyses in various places in different measures.
This section generally describes the methodological agenda that underpins this dissertation.

My method bears some resemblance to what has been termed “action research” (Small 1995) insofar as I aim to contribute to both policy and academic debates. “While the substantive focus has varied, common to all forms of action research is its agenda of producing research that can address practical concerns. However, many action researchers are also interested in contributing to the development of scientific knowledge” (Small 1995, 942). Small further notes that action researchers often utilize multiple methods to inquire into the same problem (1995, 942-3).

The combination of different methods and types of data also resembles “triangulation” approaches to social science research (Downward and Mearman 2006). Triangulation takes different forms, and four of these are noted by Downward and Mearman: data triangulation (where different sets of data are subject to the same methodological approach); investigator triangulation (where different investigators undertake field work on the same issue); theoretical triangulation (where different theories are employed to analyze the same data); and, methodological triangulation, which can be “within-method” or “between method”. The former involves using different variations on the same method, and the latter employs both quantitative and qualitative analyses (Downward and Mearman 2006, 5). Some scholars note that mixed-methods approaches to social science research act as “a means to produce a more complete picture of the investigated phenomena” (Kelle 2001, 3). Utilization of mixed methods allows for investigation of complex phenomena for which unitary methods may be poorly suited.
I utilize two of the four types of triangulation in the body of the dissertation. Data triangulation describes a major methodological component of Chapter 4. In this chapter (more below) I utilize data from three different derivatives exchanges to make the best possible case for the income security potential of futures markets. The techniques employed to manipulate and analyze the data are common across the three data sets, which correspond to three different country contexts. More generally, the dissertation is also an exercise in methodological triangulation. I employ a largely quantitative analysis in Chapter 4, a quantitative and qualitative analysis in Chapter 5, and a largely qualitative analysis in Chapter 6.

The detailed methodology employed in Chapters 4-6 of the dissertation follows below.

Chapter 4: A “best case” portrait

This chapter sets about to answer the first question I posed towards the end of the literature review section above: What exactly can hedging in futures markets do for the income of coffee farmers? It is framed by one of the two normative and analytical lenses discussed previously: income security.

Chapter 4 is designed to combat my own skepticism about the potential for futures markets to contribute to coffee farmer income security. I have thus constructed a research program that aims to be as generous as possible to futures market proponents and to give futures markets the ‘benefit of the doubt’. What emerges at the end of this chapter is a “best case” for futures markets in the coffee farmer income context, given the time period, data and country contexts with which I am working. In other words, Chapter 4 portrays the potential of futures markets in the most flattering light, relative to the
producer income problem. Of course, even this best case contains important qualifications and caveats that I point out throughout the chapter.

While the primary goal of the chapter is to make a best case for futures markets, the method that I employ in the chapter also helps to distinguish between the *quality* of the income security service provided by futures markets and the practical *accessibility* of futures markets for coffee farmers. The assumptions employed at the outset of Chapter 4’s analysis (described below) allow me to sidestep a whole host of obstacles that coffee farmers face in reality in trying to access and make good use of futures markets. The investigation thus allows for consideration of the precise income-related services that futures markets *could* provide if farmers could access and use them effectively. From a policy perspective such a distinction is crucial. Policymakers may very well want to distinguish between the usefulness of futures markets relative to income security goals on the one hand, and those practical obstacles preventing their effective use on the other.

The “best case” developed in Chapter 4 employs four different methodological mechanisms, all of which are aimed at maximizing my estimates of the income security gains from futures market trading. These are each discussed below in turn.

*Historical setting*

First, I undertake to test the gains from futures hedging in a historical setting that maximizes the gains from futures markets for ‘short hedgers’ like coffee farmers (more in the next chapter on hedging). Since the economic (quota) clauses of the ICA collapsed in 1989, the global coffee market has witnessed two prolonged slumps in prices, both largely attributed to global supply imbalances. The first coffee crisis occurred immediately after the ICA’s collapse, and lasted from roughly 1989-1992. The second
coffee crisis began in early 1998 and lasted until 2002. Regarding the latter crisis, one observer wrote in 2001, “We are living through one of the most dramatic moments in the history of coffee over the last 100 years. Export prices in constant US dollars are the lowest since 1900 and are below those recorded during the Great Depression of the 1930s, which were regarded at the time as disastrous for developing countries (Cardenas 2001, 1).” The 1998-2002 coffee crisis provides the setting within which I analyze the contributions that hedging with futures can make to ensuring the income security of farmers.

If there is any time in the recent past during which derivatives instruments could have done the most good in income terms, it is during the most recent coffee crisis when prices (and thus income from coffee) fell consistently over a four year period to the lowest levels seen in a century. As also discussed in detail in Chapter 3, hedgers that take a short position in the futures market gain when future prices fall below the level specified in the contract. During a period of falling futures prices, hedging can be income augmenting. By contrast, during a period of rising future prices, hedging can reduce incomes. Making the best income case for futures thus requires an analysis that spans a time period characterized (generally) by falling future prices.

Critics of my choice of time period within which to conduct this investigation might argue that my findings about the efficacy of futures hedging in dealing with the coffee producer income problem will be necessarily limited in scope. This is wholly correct—i.e. my conclusions about the income security benefits of futures hedging for coffee farmers are not intended as general commentaries about futures hedging, nor do they speak to the efficacy of hedging during other time periods within which said benefits
might be different than those portrayed in the later analysis. That said, there are at least three good reasons why policymakers might pay special attention to the viability of market-based price risk management instruments during times of crisis, like the 1998-2002 coffee crisis.

First, scholars have increasingly noted that global agricultural commodity markets in general have become more crisis-prone over the past roughly three decades. Brown et. al. notes that, “In the past 30 years, there have been as many price shocks across the range of commodities as there were in the preceding 75 years (2008, 1).”

Second, the global coffee market itself has witnessed two prolonged price crises since 1989. As many commentators have observed over the course of the 20th century, the global coffee market is prone to crisis given its persistent condition of “chronic oversupply” (e.g. Mold in Meyn ed. 2005, 188). The current (2008-?) global recession perhaps gives reason for concern about the possibility of yet another coffee price downturn. The ICO’s February 2009 “Coffee Market Report” notes that cash prices appear somewhat stable at the moment, given smaller-than-expected harvests in India, Columbia and Central America and thus far relatively steady demand. Yet, the organization also notes that, “the short-term behaviour of coffee prices on the New York and London futures exchanges continues to be influenced by the weak performance of major stock exchanges and financial instruments”.14 One can only hope that the influence of the recession does not become more pervasive.

Third and last, price crises, despite their relatively infrequent occurrence, are important phenomena from the perspective of personal financial planning and risk

management. Personal risk management techniques suggest that such catastrophic risks
deserve priority attention from policymakers not because they are common occurrences
(which they are not), but because their impact is potentially so devastating. In their best-
seller *Personal Financial Planning*, Hallam and Rosenbloom note that, “Insurance
against large losses is considered essential. Note that the severity of a potential loss, not
its frequency, should be the determining factor (1993, 48, italics in original).” The
importance of personal insurance against catastrophic risks suggests that, rather than
being an anomalous period in the history of coffee, the coffee price crisis requires serious
attention and study. If futures markets continue to be advocated as farm-level risk
management institutions where insurance against price volatility may be purchased, the
capacity of this insurance to deliver the goods during times of crisis becomes a very
important consideration.

*Enabling assumptions*

Second, I employ a host of assumptions that eliminate any obstacles farmers may
face in reality in accessing and effectively using futures markets. The assumptions,
enumerated below, are divided into “general”, “access-related” and “calculation
simplifying” categories, with detailed explanations also provided.

**GENERAL ASSUMPTIONS**

1. The Mexican farmer hedges using the coffee “C” futures contract from ICE, that
   trades for delivery in March, May, July, September and December, and which specifies
   37,500 pounds of washed, green Arabica beans from a variety of origins including
   Mexico.
The Brazilian farmer hedges using the Arabica coffee futures contract traded on the BM&F for delivery in March, May, July, September and December that specifies 13,288 pounds (6,000 kilograms) of washed, green, Brazilian Arabica beans.\textsuperscript{15}

The Ugandan farmer hedges using the Robusta coffee futures contract traded on LIFFE/Euronext for delivery in January, March, May, July, September and November that specifies 11,023 lbs (5,000 kilograms) of washed, green Robusta beans from a variety of origins including Uganda.

These exchanges are those that a farmer in each of the three countries would most likely use given their respective locations and the type and quality of coffee traded on each.

2. Hedged positions are closed out via offsetting trades.

This is the most common method employed by traders to close their positions (see Chapter 3). Physical delivery, while possible, generally occurs only a small fraction of the time. Closure via offsetting trade also eliminates the obstacles associated with getting the coffee to the delivery points specified by the exchanges (most are North American and Western European ports). As an example, a farmer who is short one futures contract will close his position by buying one futures contract whenever he decides it is time to lift the hedge. The selling price less the price at which the contract is bought back, multiplied by the quantity of coffee specified in the contract, constitutes the ‘gains from

\textsuperscript{15}The mini Arabica contract offered on the BM&F specifies only 600 kilograms of coffee. This is arguably a contract better suited to small farmers. However, according to the exchange, trading volume was 13 contracts in 2006, and there was no recorded volume at all in 2007. Such illiquidity made the contract infeasible for use in my calculations and arguably for effective use by coffee producers.
the hedge’. Also note that this assumption implies that a farmer’s coffee crop is marketed and sold locally which somewhat neutralizes concerns about coffee quality.

ACCESS-RELATED ASSUMPTIONS

3. For Mexico, the farmer’s crop is exactly 37,500 pounds for each crop year. For Brazil, the farmer’s crop is exactly 6,000 kilograms (13,228 pounds) for each crop year. For Uganda, the farmer’s crop is exactly 5,000 kilograms (11,023 pounds) for each crop year.

These quantities correspond to the minimum lot size specified in the coffee contracts on each exchange. If the farmer’s goal is to hedge (and not to speculate) then she needs to grow at least this much coffee. Also note that this assumption eliminates yield (output) risk.

4. The farmer hedges her entire crop.

Absent yield risk the optimal hedge involves hedging all of a farmer’s output (assuming the farmer is risk-averse). See Peck (1975) and Rolfo (1980) for more information.

5. There are no transaction costs for the farmer (e.g. brokerage fees, clearing and exchange fees, minimum brokerage account requirements).

These costs may be prohibitive for farmers in practice, particularly minimum brokerage account requirements.

6. The farmer is able to put up the initial margin and make the necessary margin calls.

On ICE the initial margin for hedgers using the coffee “C” contract is US$2500 per contract bought or sold. On LIFFE, the initial margin for hedgers using the Robusta
coffee contract is US$1250 per contract bought or sold.\textsuperscript{16} On the BM&F the initial margin is determined formulaically on the basis of individual risk exposures and contract specifics, but the exchange notes that the maximum margin for short hedgers is roughly US$650-US$720. Margin requirements are widely recognized as a financial obstacle to futures trading for many farmers.

7. The farmer has full information about the coffee and futures market.

Of course, this does not mean full information about the future. In practice, many farmers do not even have access to basic cash market price information. See UNCTAD (2004) for more information.

8. The farmer has sufficient knowledge of and skills germane to futures trading (regarding strategies, etc.) to devise and make the trades below.

Or, at the very least, the farmer has sufficient knowledge and skills to be able to speak with a broker intelligently about strategy. The full information assumption above should be distinguished from knowledge, skills and techniques necessary for effective use and processing of information. World Bank researchers often refers to this dimension of futures trading as “technical capacity”. See CRMG 2005-(lessons learned piece) for more information.

9. The farmer can find a broker that is willing to deal in small (one contract) transaction volumes.

In practice brokers face sizeable transaction costs and information obstacles that preclude taking on small clients. Due diligence and “know your client” requirements are

subject to economies of scale, making clients trading in small volumes undesirable. See Dodd (2007) and CRMG (2005a) for more information.

**CALCULATION-SIMPLIFYING ASSUMPTIONS**

10. There is no possibility of coffee storage.

This assumption impacts the income gains from coffee sales, but not from hedging. It is thus consistent with my effort here to maximize the gains from hedging. If storage were possible this would provide farmers with another opportunity to hedge against price risk. Some coffee could be stored and sold later in the year when cash prices were higher, a practice referred to as “price averaging”. This allows for reduction of risk associated with seasonal price fluctuations but does not necessarily protect farmers from non-seasonal price volatility like that which occurred during the recent coffee crisis. The ultimate impact of storage on farmer incomes is uncertain, however, and depends upon cash price trends and the costs of carry. See Tomek and Peterson (2000) and Pindyck (2001) for more information.

I am thus assuming that coffee farmers sell their coffee as soon as it is harvested and dried. This implies periodic sales over the course of the harvest season. In order to account for this effect I have used the average of coffee prices paid to growers over the harvest period to calculate income from coffee sales. This assumption simplifies my calculations insofar as I do not have to determine how much coffee farmers would store for how long, a decision that is likely to vary from farmer to farmer. Further, private storage facilities (warehouses) tend to be sparse (or nonexistent) in many developing countries making the assumption reasonable as well as helpful (see, e.g., World Bank
2008, 119 for a discussion of the lack of storage options for small and mid-sized
developing country producers).

11. The farmer withdraws the proceeds from hedging from his margin account
once each year, during the last month of the crop year after the hedge has begun (March
in Mexico; September in Brazil; and February in Uganda).

Futures trading accounts are “marked-to-market” daily, meaning that the day’s gains
and losses are tallied at the end of each trading day. If a hedger gained on a given day
her margin account would reflect a higher balance. If a hedger lost on a given day she
might have to deposit money in her margin account (a margin call) to account for the
loss. Margin calls thus affect what Friedman calls the “time-pattern of cash receipts”
(1954, 699). Put differently, “…the day to day fluctuations of the futures price will
generate a series of random cash flows over the period during which a futures position is
held. This is due to the requirement that futures accounts "mark to market" daily
(Anderson and Danthine 1983, 249).”

In some cases margin calls can be disruptive and destabilizing. A US farmer
recently interviewed in The New York Times stated: “The nightmare scenario is when
you have to make margin and you’re looking out your back door and seeing, maybe, a
crop problem. Everybody has a story about a guy they know getting blown out of his
hedge” by unmet margin calls (Henriques 4/22/2008).” However, in the case of short
hedge in an environment of falling prices, on balance marking-to-market results in the
margin account growing (although in all of the scenarios worked out below there were
trading losses due to future price volatility). In theory a farmer could withdraw gains
from the account periodically (every day, week, month, year). This does not affect the size of the gains, but does affect the timing of their receipt by the farmer.

The assumption I make here does not detract from the concerns raised later on about the volatility of future prices and the correlate problems that arise for farmers in figuring out how much to save, invest and consume in any given year. These questions would still arise if a farmer received a bit of cash from her margin account daily. The only difference would be that the farmer would have to make such decisions every day, week or month, as opposed to once per year. Further, this assumption does not impact my calculations as to inter-seasonal income stability for which the seasonal gains from the hedge are aggregated and compared to the gains of other successive crop seasons. However, it does impact my calculations as to intra-seasonal income stability and will be addressed in the appropriate section in Chapter 4.

*Evaluative criteria—stability and certainty*

Third, I utilize primarily the narrow conception of income security most frequently suggested by futures markets proponents themselves—that is, income stability. As already noted above, stability is frequently treated as synonymous with certainty. The chapter thus also addresses this matter as well.

As an example, Ronald McKinnon notes in his discussion of derivatives relative to public stabilization that the particular policy goal governments hope to achieve via such arrangements is “the *stabilization* of producer incomes” (1963, 844, emphasis added). Varangis and Larson argue that, “In general, ICAs [international commodity agreements] and government support programs (commodity stabilization funds, buffer stocks, etc.) attempt to make the distribution of prices *less variable* (1996, 1, emphasis added).” They
go on to suggest that futures markets may effectively play this role instead with parallel impacts on incomes. Bauer and Paish focus their discussions of commodity price stabilization on the “reduction of fluctuations in the incomes of primary producers” (1952; 1954, emphasis added). Milton Friedman too frames the matter of commodity price risk management in terms of stabilizing producer incomes (1954, 698). Similarly, Newberry and Stiglitz write in their treatise, *The Theory of Commodity Price Stabilization*: “One of our main arguments is that producers are concerned not so much with price variability as with income variability (1981, 15, emphasis added).”

That said, many such scholars indirectly concern themselves with absolute income levels in the context of income stability and capital rationing (more in Chapter 4 on this phenomenon). The ITF for example describes the benefits of “reducing the vulnerability associated with price volatility”: reducing volatility can “add certainty about the minimum income producers will receive from their crop and allow them to make better farm management decisions regarding purchased inputs and labor use” (ITF 2006a, 1). Further, “To mitigate risks at the farm level, many producers adopt low-risk and low yield crop and production patterns to ensure a minimum income [i.e. capital rationing]. These production patterns come at the expense of higher-risk, higher-return production techniques that could create income growth and increase capital (ITF 2006a, 2).”

Varangis, et. al., agree that, “There is strong evidence that farmers in poor rural communities are risk-averse and take actions that result in lower, but more stable incomes (2002, 6).” This suggests a concern with absolute income levels, insofar as short term income instability may come at the cost of long term income gains, but stops short of consideration of their adequacy.
It is also important to note the ITF’s wording here. It is adding *certainty* about minimum incomes that encourages farmers to take on those riskier investments that may augment incomes in the long-term. This implies that incomes must not only be stable, but that farmers must know *in advance* that incomes *will be* stable in order that they can feel sufficiently comfortable making risky investments today on the basis of future income streams. Put differently, income must be *predictably* stable in order to discourage capital rationing. This is another important point that will come up again later in the analysis.

Reflecting this focus found in much of the technical microeconomic and World Bank literature on the topic, I evaluate the contributions of hedging with futures to the income security of coffee farmers on income stability and certainty grounds only. The relationship between income stability and income certainty will also be discussed and explored in more detail below.

*Income adequacy—one more criterion*

In addition, I complement the analysis of stability and certainty with a discussion of income adequacy. While very few researchers recommend futures trading for the purposes of augmenting producer incomes (Dodd 2007 is a notable exception), my analysis suggests that under certain conditions hedging with futures can raise coffee farmer incomes quite significantly. As these findings serve to bolster the policy case for futures markets I include them in the chapter.

*Data*

Chapter 4 is dominated by quantitative measures of the income stability, certainty and adequacy contributions of hedging with futures contracts. Using price data from
three separate coffee futures exchanges and from the International Coffee Organization (ICO), I measure both intra-seasonal and inter-seasonal income stability as provided by not hedging, five different rollover hedging strategies and one annual hedging strategy (more below). The data generated are also used to explore the matter of income certainty and income adequacy. More qualitative considerations, particularly as to the importance of income stability and certainty for farmer well being, are further incorporated into the chapter. The work from which these data are drawn is cited in the appropriate places throughout.

The precise nature of the quantitative data I utilize throughout the investigation is delineated below.

Historical future price, open interest and volume data from the following derivatives exchanges are used extensively:

1. The New York Board of Trade (NYBOT), now part of the Intercontinental Exchange (ICE), for data on the coffee “C” contract that is the focus of the Mexican case.

2. The Bolsa de Mercados y Futures (BM&F) for the Brazilian Arabica contract which is the focus of the Brazilian case.

3. The London International Financial Futures and Options Exchange (LIFFE), now part of Euronext, for the Robusta contract that is the focus of the Ugandan case.

Historical coffee prices paid to growers in each country were obtained from the International Coffee Organization’s (ICO) statistical database.

Inflation and exchange rate data used to make various adjustments are from the IMF obtained via the United States Department of Agriculture (USDA).
The rollover strategies utilized are modeled on those that appear in the work of various researchers, including Lence and Hayenga (2001), Dodd (2007), and Gardner (1989). The specifics of each strategy for each country case are detailed in the Appendix.

The hedging strategies

As noted above, I measure the income stability, certainty and adequacy gains from hedging across seven different strategies. Below, I briefly describe these strategies. The strategies are also further discussed in Chapter 4.

1. **Not hedging**: This strategy is the most simple and likely describes most accurately the current position of most coffee farmers in the three case countries. Not hedging means that the farmer simply sells her coffee crop periodically over the course of the harvest season.

2. **The plain annual hedge** (hereafter referred to as the “plain annual”): This strategy is the simplest of the hedging strategies. It involves the farmer in question selling her crop forward one crop season at a time for the 4 years of the crisis by selling one contract at the beginning of the crop season for delivery at the end of the crop season. From the farmer’s perspective, this strategy likely involves the least time and effort of the six hedging strategies, and avoids some of the risks involved in and financing required for rollover hedging.

3. **The rollover annual hedge** (hereafter referred to as the “rollover annual”): This strategy is the one most commonly employed by commodities traders. A rollover hedge allows traders to take advantage of the best futures prices by ensuring that said trader is constantly dealing in the most liquid, front-month contract markets. While this technique does reduce a hedger’s liquidity risk, it also potentially
introduces new risks (e.g. if the price at which the 2nd nearby is sold is lower than the price at which the 1st nearby was just bought back). The rollover annual involves a given farmer performing 4 consecutive one-crop season rollover hedges over the duration of the crisis. Taken together, the plain and rollover annual hedges appear to be the types of strategies most frequently referenced in the technical futures literature.

4. **Rollover #1:** This strategy is also a rollover hedge, but it is designed to try to lock in prices for 2 years, rather than one. A two-year time horizon for a forward sale is generally not viable on futures exchanges because contracts do not extend that far into the future (and, when they are post-dated that far forward the market tends to be exceptionally illiquid). In theory, this strategy would artificially extend the markets into the future by requiring the farmer to sell two seasons’ worth of coffee in year one, and only one seasons’ harvest in year two. Strategies that extend further forward than one crop season are especially important for producers of perennial crops like coffee, for whom many farm-level investments are undertaken over a longer time-period than those of producers of annual crops.

5. **Rollover #2:** This strategy is a rollover hedge that is designed to try to lock in prices for 4 years, rather than one. Again, strategies of longer duration may be important for producers of perennial crops. Further, both Rollovers #1 and #2 might represent the strategies undertaken by farmers who expected the coffee price downturn of 1998 to last for some time. Given the 2-3 year duration of the 1989-1992 coffee crisis, such an expectation would have been reasonable.

6. **Rollover #3:** This rollover strategy is one of two “panic” strategies that I employ. In each country case the plain annual, rollover annual, Rollover #1 and
Rollover #2 all begin at the “onset” of the crisis (or that time in 1998 or 1999 when local coffee prices were significantly lower than prices at the same time the year before—see Chapter 4). These strategies may thus be considered “risk reduction” strategies that are “intended to prevent the occurrence of a loss” (Hallam and Rosenbloom 1993, 46). By contrast, Rollover #3 begins in the middle of the crisis, when prices had already reached relatively low levels. For a farmer that was reluctant to hedge at the beginning of the crisis, perhaps because she did not want to foreclose the opportunity to benefit from a price upswing, Rollover #3 might represent a panicked attempt to reduce income losses from price collapse. This strategy has a duration of one year, and the rollover technique employed is similar to that of the rollover annual.

7. **Rollover #4**: Similarly to #3, Rollover #4 is another “panic” strategy that begins toward the end of the crisis and has a duration of one year. Like Rollover #3, #4 is also a “loss control” strategy that attempts to “minimize a loss should one occur” (Hallam and Rosenbloom 1993, 46).

To sum up, in varying these strategies I try to partially account for the fact that different farmers may have different preferences for risk, different expectations about the future and different thresholds for the time and effort involved in some of the more complicated strategies. I also try to account for the fact that hedging may be considered both a strategy for risk reduction and for loss control.\(^{17}\) To reiterate, each of these seven

\[^{17}\text{As opposed to “risk prevention”, which futures markets cannot help with. The distinctions between risk prevention, risk reduction (also called “mitigation” by some) and loss control (called “coping” by some) has been adopted by poverty and vulnerability scholars (e.g. Holzmann and Jorgenson 2000, Morduch 1999 and Holzmann 2001) as well as by personal financial planners like Hallam and Rosenbloom (1993). These}\]
strategies will be analyzed in Chapter 4 with regard to their respective abilities to ameliorate the producer income problem during the coffee crisis.

Chapter 5: Access and income inequality

Whereas Chapter 4 is concerned with the income security service that futures hedging can provide, Chapter 5 takes up the issue of futures market access, particularly for small coffee producers. It generally seeks to address the following question that I raised towards the end of the literature review section: What is the nature and extent of the access obstacles that confront farmers who try to access futures markets? It is framed by the other of the two normative and analytical lenses discussed previously: small farmers.

Methodologically, Chapter 5 is by and large an exercise in interrogating the access related assumptions made in Chapter 4’s analysis. It details for each country case the nature and extent of five different access-related problems: size, yield risk, cost, information and knowledge. These access issues are drawn directly from the assumptions made above.

Consistent with the focus on assumptions, the second portion of the chapter addresses a further assumption that I implicitly make in the first portion—namely, that access is important for farmer welfare. I scrutinize my own assumption and address potential critics with reference to the shortcomings of the price discovery mechanism in terms are at times useful ways to distinguish between the specific capabilities/goals of particular approaches to managing income (and other) risks.
futures markets and the disproportionate impact that futures market exclusion has on small, poor farmers relative to their larger, wealthier counterparts.

The third and final portion of the chapter returns to the question of income security and integrates my findings about futures market access. In particular, the earlier discussion of access allows me to address the fourth and remaining dimension of income security mentioned above, income (in)equality. Drawing upon the data generated in Chapter 4 as well as upon my own theoretical analysis, I sketch the relative income dynamics that may result from the systematic recommendation of futures markets as an income security arrangement for coffee farmers.

Data

Chapter 5 utilizes both quantitative data from various sources, as well as data from the work of other researchers. In particular, I draw on the work of other researchers extensively in documenting the extent and nature of information- and knowledge-related access obstacles in the three case countries. I further utilize existing research in my discussion of price discovery in coffee futures markets. These sources are cited in the appropriate places throughout.

In my discussion of size, yield and cost obstacles to futures trading I draw heavily upon quantitative data from a variety of sources. Data on coffee farm size for Brazil and Mexico is taken from each country’s respective agricultural census, as documented by FAO. Historical yield data is taken from the statistical database of the FAO, called FAOSTAT. Information regarding the costs of futures trading are taken from the various futures exchanges as well as from my own Internet-based survey of brokerage fees and account requirements.
Finally, to reiterate, the last portion of the chapter utilizes the data that I generate in Chapter 4.

Chapter 6: Futures market intermediaries and income security alternatives

This last portion of the three part investigation address the remaining two questions posed at the end of the literature review section: Is ‘fixing’ access problems via futures market intermediation worth the time, energy and resources of policymakers and other actors involved in such initiatives? And, what income security alternatives are available? As such, Chapter 6 is a policy discussion. While the previous two chapters also speak to policy, Chapter 6 is framed specifically in this way.

Consistent with the prior to chapters, Chapter 6 is framed by both of the normative and analytical lenses discussed previously: income security and small farmers. The first portion of the chapter describes and evaluates futures market intermediaries on the basis of the income security service provided and their successes in serving small coffee farmers. In Mexico, I examine a farmer cooperative and government intermediary. In Brazil, I examine a government intermediary and intermediation via financial product innovation. In Uganda, I examine intermediation by a national umbrella cooperative and a local bank.

My choice of which intermediaries to examine in each country case reflects several considerations. Across all three cases, I lend the analysis some institutional variety by looking at both private and public institutions of different types. In the Mexican case, while there are several cooperatives attempting to engage futures markets, I selected one that appeared generally representative of the combined experiences of all. In Brazil and
Uganda, I examined all of those intermediaries that I found any reference to at all—only two in each case.

The second portion of the chapter examines several income security alternatives to futures markets. I examine each alternative in a different country context: supply management in Mexico, alternative crop diversification in Brazil, and, Fairtrade in Uganda. Placing each alternative in a specific country context allows me to present the reader with actual facts and figures about how the arrangement operates. I utilize the same two evaluative criteria that I have applied throughout to this discussion: the income security service provided by each arrangement and the degree to which smallholders are incorporated therein.

My choice of alternatives to discuss reflects several considerations. Supply management dominated post-WWII coffee policy and has often been juxtaposed to derivatives markets by critics (e.g. McKinnon 1967). Alternative crop diversification, among other forms of diversification, is viewed by many researchers as perhaps the only real long-term solution to the producer income problem and chronic oversupply in the coffee market. Fairtrade is currently growing in academic popularity, with an increasing number of scholars devoting significant attention to this and other alternative trading networks. These alternatives also span both government-centered and market-based arrangements, lending variety in institutional form to the discussion. My pairing of a specific alternative with a particular country case is methodologically quite random, as any of these alternatives could be (and should be) similarly discussed in each country context. Even at the outset, this suggests a sizeable and significant future research agenda.
To sum up, as a whole the chapter suggests the usefulness of income security and the needs of small farmers as principles with which to sort through various policy recommendations and income security alternatives.

Data

Chapter 6’s analysis is drawn almost entirely from the work of other researchers. In particular, the World Bank’s International Task Force on Commodity Price Risk Management (ITF) and Commodity Risk Management Group (CRMG) have extensively documented their experiences with various experiments and pilot programs in futures market intermediation. I draw heavily on this and like research. These summaries, studies and evaluations are cited in the appropriate places throughout.

The discussion of supply management in Mexico in the second part of the chapter undertakes a quantitative analysis of the income security service afforded by the ICA’s and the Mexican Coffee Institute’s (INMECAFE) price fixing during the 1970s-80s. I utilize the ICO’s data on historical prices paid to growers, as well as exchange rate and inflation data from the IMF (via the USDA) to make these calculations. I make similar calculations in the context of Fairtrade in Uganda using Fairtrade price data from the Fairtrade Labeling Organization (FLO).

As with the intermediaries, the discussion of alternatives is indebted to the work of other researchers. In particular, recent work by economic geographers and agricultural development researchers is cited extensively in the discussion of crop diversification in Brazil. These studies are cited in the appropriate places throughout.
Conclusions

To sum up, the body of this investigation into the income security potential of derivative instruments for small coffee farmers in Mexico, Brazil and Uganda comprises Chapters 4-6. There are at least three ways that readers may usefully think of the method, purpose and organization of these chapters.

First, readers may want to consider the policy-related questions that each chapter asks and discusses:

- Chapter 4: What exactly can hedging in futures markets do for the income of coffee farmers?
- Chapter 5: What is the nature and extent of the access obstacles that confront farmers who try to access futures markets?
- Chapter 6: Is ‘fixing’ access problems via futures market intermediation worth the time, energy and resources of policymakers and other actors involved in such initiatives? And, what income security alternatives are available in the coffee context?

Collectively, these separate questions speak to the broader research question that informs the dissertation as a whole: To what extent do futures markets provide for the income security of small coffee farmers? And, what does this imply for policy?

Second, readers may want to associate each chapter’s discussion with the evaluative criterion, i.e. that normative and analytical ‘lens’, that frames it. Keep in mind, however, that each chapter at least touches upon both major criterion, even if only briefly. By this reasoning, the chapters are as follows:
• Chapter 4: Income security (via futures markets)

• Chapter 5: Small farmers (and futures markets)

• Chapter 6: Income security and small farmers (in futures market intermediaries and income security alternatives)

Third, I ask readers to keep in mind that each subsequent chapter builds upon the analysis that precedes it. In this manner I develop what DeMartino refers to as an “escalating” policy case for the use of alternative risk management arrangements in the small coffee producer context (DeMartino forthcoming). The escalating policy case, just to give the reader a preview, looks roughly like this:

• Chapter 4: At best, futures markets provide an ambiguous income security service.

• Chapter 5: Even further, futures markets systematically exclude that population of coffee farmers that needs income support most—small producers.

• Chapter 6: Further still, futures market intermediation efforts have not incorporated small producers to any large degree, not to mention that alternatives exist that appear to provide a superior income security service and better serve small producers.

I encourage the reader to think of the analysis that comes next in all three of these ways.

The next chapter, Chapter 3, sets up the analysis in subsequent chapters, providing relevant background on both coffee and derivatives markets.
CHAPTER THREE
Background: coffee and derivatives

“For the farmer, protection against a severe decline in his prices was (and remains) of paramount urgency.”
   - John Kenneth Galbraith

“If you could precisely estimate the price of risk…[it] would, to all intents and purposes, be reduced to a conscious choice. Risk would cease to be so risky.”
   - Dick Bryan and Michael Rafferty

Introduction

The purpose of this chapter is twofold. First, I provide general background information about coffee production and markets, with special emphasis on the behavior of coffee prices and those arrangements erected in the past to manage the associated risk. Second, I discuss derivatives markets (futures markets in particular), what they are and how they work, with special emphasis on their role in risk management and price discovery. This discussion forms the backdrop for the analyses in subsequent chapters.

On coffee

Two main varieties of coffee are grown in the world’s tropical places. Arabica beans are higher quality, less bitter, more expensive, and generally grow in the higher elevations of Latin America, East Africa and South and Southeast Asia. Robusta beans

are lower quality, have a very bitter taste, are generally (but not exclusively) used in
instant coffees and espresso blends, are cheaper and grow in hot, lowland areas of Brazil,
Western and Central Africa and South and Southeast Asia.

Coffee grows on trees (or bushes), and coffee “cherries” cannot be harvested until
several years after planting (2-3 years for Robusta trees; 4-5 years for Arabica trees).
This long growing-harvest cycle means, among other things, that coffee producers face
significant price risks (prices can change dramatically over this time) and that farm
capital is tied up for long periods of time (requiring farmers to be well capitalized and/or
have regular access to credit). Further, on a single tree one might find both ripe and
unripe cherries, making harvesting a labor intensive process (only in Brazil is coffee
harvesting mechanized to any great degree). Under the fleshy outside of the cherry is a
hull that protects the seeds inside. Under the hull is a thin seed cover called “parchment”,
under which reside two coffee beans or seeds. Green coffee beans are considered
inedible, and are traditionally roasted prior to consumption. Most of the world’s coffee
trade is dominated by the exchange of green beans packed in 60 kilogram bags.\(^{20}\)

Coffee is second only to crude oil among the most widely traded legal commodities
in the world. Coffee trading dates back to the Yemeni port of Mocha in the 16\(^{th}\) century,
but Wild (2004) finds coffee’s origin in the Ethiopian highlands perhaps thousands of
years earlier. He posits that Sufi missionaries, who traveled extensively over the Middle
East and northern Africa during the 15\(^{th}\) and 16\(^{th}\) centuries, ultimately brought coffee
from Ethiopia to Yemen, where it was grown to feed demand from the Ottoman Empire.
At Mocha, coffee was ‘discovered’ by Dutch and British traders, who brought the new

\(^{20}\) Green coffee beans are de-hulled, cleaned, unroasted coffee beans.
commodity back to Europe and also to their tropical colonies. The Dutch brought coffee to Java and Sumatra in Indonesia. The British brought it to East African colonies like Kenya and Uganda. Legend has it that a Dutch diplomat brought coffee to the court of French Emperor Louis XIV, who cultivated several trees in his private greenhouse. From this private cache, a couple of trees were taken to the French colony of Martinique. From the Caribbean, coffee cultivation spread throughout Latin America. The French also introduced coffee to their African colonies, like Cameroon, Madagascar and Cote D’Ivoire; and in the 1850s, they brought coffee seeds to Indochina (now Vietnam). Legend also has it that Saint Bababudan brought coffee from Yemen to the Indian subcontinent. It should be noted that the manner in which coffee cultivation spread from Ethiopia is a matter of some mystery and disagreement among coffee historians (Wild, 2004).

Like sugar, cotton, tea, and cocoa, coffee was cultivated during the colonial era by hundreds of thousands of African slaves and exported to the lighter-skinned consumer markets in North America and Europe. Today, some scholars maintain that little has changed in global coffee consumption and production patterns—Northern consumers and corporations continue to enjoy the fruits of under-compensated Southern farmers, generating a “core-periphery” system of international production like that described by world systems theorist Immanuel Wallerstein (1974). Wild notes: “With the dieback of former European imperialism, and the increasing assertion of the hegemony of the USA over the western hemisphere, the many coffee-producing countries of Central and South America have found themselves overtaken by US neocolonialism (2004: 15).” This neocolonialism is marked by the dominance of American and European MNCs over
coffee production and trade. Ponte similarly argues that the global coffee commodity chain, which begins with production in the South and ends with consumption mostly in the North, is a “buyer-driven” chain: coffee producers are subordinated to the market power of Northern roasters and manufacturers like Nestlé and Philip Morris, with negative impacts on their freedom and welfare (2002: 1112). This commentary echoes that of Prebisch (1950) and Singer (1950), both of whom also found objectionable at an earlier time the subjugation of Southern agriculture to Northern commerce and industry.

**Geography and scale of production and consumption**

Ninety percent of the world’s coffee is grown in the developing world (Ponte, 2002: 1101). The table below shows the world’s top ten coffee-producing countries in 2005. As can be seen, the world’s top producers span three continents—North America, South America and Asia.

**Figure 3.1: World Coffee Production by Country, 2005**

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Bags Produced (60 kg bags)</th>
<th>% of Total World Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>32,944,000</td>
<td>30%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>13,499,000</td>
<td>12.3%</td>
</tr>
<tr>
<td>Colombia</td>
<td>11,959,000</td>
<td>10.9%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>8,659,000</td>
<td>7.9%</td>
</tr>
<tr>
<td>India</td>
<td>4,617,000</td>
<td>4.2%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>4,500,000</td>
<td>4.1%</td>
</tr>
<tr>
<td>Mexico</td>
<td>4,000,000</td>
<td>3.7%</td>
</tr>
<tr>
<td>Guatemala</td>
<td>3,675,000</td>
<td>3.4%</td>
</tr>
<tr>
<td>Honduras</td>
<td>3,204,000</td>
<td>2.9%</td>
</tr>
<tr>
<td>Peru</td>
<td>2,420,000</td>
<td>2.2%</td>
</tr>
<tr>
<td><strong>Total of top 10 producers</strong></td>
<td><strong>89,477,000</strong></td>
<td><strong>81.7%</strong></td>
</tr>
</tbody>
</table>

Despite the fact that just ten countries grow over four-fifths of the world’s coffee, coffee is an extremely important commodity, nationally speaking, even for many of those countries that make up only a small share of world production. “For example, coffee accounts for more than half of total merchandise exports in Burundi, Rwanda, and Ethiopia and more than 20 percent in Guatemala, Honduras, and Nicaragua. (Baffes, et. al. 2005, 297).” Looking to the three case countries considered here, only Uganda’s economy is relatively coffee dependent—during the 2000-1 crop season coffee exports accounted for over 30% of Ugandan export revenues (Sayer 2002, 11).\(^{22}\) Commodity dependence is cause for serious concern among international development institutions and researchers. The FAO notes, “Such dependency means that coffee price variations have significant multiplier effects on employment and incomes beyond production itself in related upstream and downstream industries, and across the economy in general (FAO 2003, 7).” For economies such as these, economic development prospects frequently hinge upon the price commanded by a single good on world markets.

Not only are coffee-producing countries dependent on coffee for export earnings, but so too are coffee farmers dependent on coffee for their livelihood. The World Bank estimates that some 20-25 million families produce coffee in some 50 developing countries, the vast majority of which are “smallholders”, and that some 100 million people worldwide are directly affected economically by the coffee trade (Lewin, et, al. 2004, xi). Seventy percent of the world’s coffee is grown on farms of less than 25 acres in size; of these, the vast majority of coffee farms are between 2.5 and 12.5 acres

\(^{22}\) Although still very dependent on coffee export earnings, Uganda’s dependence has declined significantly since the 1970s-80s when coffee exports accounted for some 80-90% of total export earnings.
(Gresser and Tickell 2002, 7). Wild estimates that some 25 million small farmers worldwide depend on coffee as their only source of income, and that some 125 million people depended on coffee directly or indirectly in 2002 (2004, 1). Charveriat puts the figure at 20 million households that depend on coffee production for their primary, and sometimes only, source of income (2001, 2). Among other things, these figures highlight the sheer size of the global community that is impacted by changes in coffee prices, with millions of individuals and families having no other source of cash income aside from that generated via coffee sales.

Coffee consumers are generally concentrated in the global North, with the United States as the largest coffee consuming country by volume. The ICO reports that between 1965-2003, the United States was responsible, on average, for roughly 30% of world coffee consumption. Germany, the second largest consumer worldwide, accounts for just over 12% of world consumption over the same time period. France is next with just about 7.5%, followed by Italy and Japan, which each account for about 6% of total world consumption between 1965-2003 (ICO 2004, 2). Today, efforts to expand coffee consumption focus extensively upon developing demand in the global South, with Northern markets generally considered to be relatively saturated.

**The global coffee commodity chain**

Accounts of global commodity chains and their many variants and adaptations (e.g. value chains, production networks, production circuits) have become an increasingly important feature of studies of globalization and of economic development.23 Such

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23 Within this growing literature there is debate as to the virtues of a “chain” versus a “network” approach. Gary Gereffi and Richard Appelbaum, pioneers of the commodity and value chain approaches, note that the
approaches are argued to be better suited to describing relations of production and distribution, to unraveling the complexity of productive relations and distribution, in a world in which national production has been replaced by a globally fragmented production process (Dicken 2007). Indeed, “Globalization…has undercut the validity of traditional, state-centred, forms of social science, and with that the agendas that hitherto have guided the vast majority of research on economic and social development (Henderson, et.al. 2002, 438).” While sensitive to national-level analyses where appropriate, the global chain and/or network framework enables scholars to look at the entirety of a production process at multiple levels of analysis, incorporating historical change as well as relational issues like power, cooperation, and exploitation.

While I am not concerned with constructing a nuanced and detailed global coffee commodity chain (which is outside the scope of this project), below I present a general chain approach alters the core-periphery world system that prevailed in the past by understanding that “core” and “peripheral” are no longer descriptors of entire nations, but rather that they more aptly describe various “nodes” along a production chain (Applebaum and Gereffi in Bonacich, ed. 1994, 43). While Wallerstein and others put forth the notion that productive surplus, acquired via exploitative means, accrued to core nations, Gereffi argues that in a globally fragmented production process surplus accrues to actors in core stages of the production process. This implicit sensitivity to the distribution of the surplus (income) along the chain and the attending relations of power and coercion differentiate, to some extent, this approach from the “network” approach.

While not insensitive to matters of power, inequality and exploitation, what seemingly recommends the network approach, in contrast to the chain approach, is its insistence upon non-linear presentations of production and distribution processes. Focusing upon flows, forward and backward and diagonal, the network approach appreciates the overwhelming complexity of global economic processes and relations. Peter Dicken notes that, “Such networks are, in reality, extremely complex structures with intricate links—horizontal, vertical, diagonal—forming multidimensional, multilayered lattices of economic activity (Dicken 2007, 15).”

While I utilize the word “chain” for the sake of simplicity and consistency, the contribution of the network literature is implicit in my discussions. As can be seen below, the chain is not linear and illustrates flows between nodes.
outline of the global coffee commodity chain (GCCC) which draws upon the chain that appears in Ponte’s recent article as a partial model (2002, 1102). Most importantly, the diagram is intended to orient readers to the major types of actors in the global coffee sector and how each is positioned relative to the others both geographically and productively. The chain presented below will be integrated into later discussions, serving as one framework through which to discuss the rise of new financial intermediaries and evaluate the impact of hedging with futures contracts on coffee farmer income security. Issues of power and income inequality, central to commodity chain analyses, are especially relevant in this latter context.

The global coffee commodity chain appears on the following page.
FIGURE 3.2: THE GLOBAL COFFEE COMMODITY CHAIN

FLOWS
- Upstream (from producer to consumer): Coffee (green and roasted). All coffee trade is in green beans until it reaches the roaster or manufacturer.
- Downstream (from consumer to producer): Information. Demand information, especially about quality.
- Inter-chain (flows between the coffee chain and nodes in ancillary chains): information, goods and services

GEOGRAPHY
Nodes of the chain generally located in the global South
Nodes of the chain generally located in the global North
Ancillary chains with their own unique production and distribution geographies
The global coffee commodity chain (GCCC) is a complicated and globally fragmented network that ultimately links producers with consumers, with a whole host of actors (or ‘nodes’ on the chain) intermediating the process. Small producers sell their crop to larger estates, to hullers and curers, and/or to domestic traders/agents, cooperatives and other farmer groups. Estates, cooperatives and other domestic intermediaries then sell to exporters. In the past exporters were usually small and medium-sized, domestically owned enterprises. Ponte (2002) notes that since coffee market liberalization began in the late 1980s domestic exporters are increasingly being absorbed or out-competed by large, multinational trading firms (the ‘international trader’ node on the chain). This is one example of the fluidity of the chain’s geography and structure. Indeed, the illustration above is vastly oversimplified. Among other things, it does not account for new flows and actors that have arisen in the context of Fairtrade and other specialty markets.

Trading firms then sell green coffee beans either to a broker or directly to the coffee roaster or manufacturer. It is at this node of the chain that coffee becomes much more diversified, with instant coffees, roasted coffees, differently packaged coffees, as a few examples, issuing from this node and moving further downstream where these now diverse products are bought by retailers, supermarkets, cafés and restaurants.\(^{24}\) The final consumer then purchases the final retail product.

These downstream flows are not the only flows apparent even in this oversimplified GCCC. Indeed, and much in line with Dicken’s insistence (2007) that the production

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\(^{24}\) As discussed earlier there is a disjuncture between the price of green coffee and the retail price of coffee that originates largely from product differentiation and the market power of large corporations in final retail markets.
process is not linear or unidirectional, important flows also move upstream. In particular, information of all sorts flows from consumers back up to producers. Information about quality is one of the more important informational flows, even more so since market liberalization (Ponte 2002). Financing may also flow upstream, especially when curers/hullers and/or domestic and international traders pre-finance coffee production in exchange for delivery guarantees after harvest.

The GCCC pictured above also gives a rudimentary and partial illustration of other chains that are ancillary to the production process. Chains for input production and distribution (like fertilizers, pesticides, seedlings and labor), and for financing and risk management are among those subsidiary chains that link up with the coffee commodity chain. As noted in Chapter 2, the structure of these chains (e.g. levels of market concentration) and the differing abilities of coffee farmers to participate in them are among those factors that disadvantage small coffee farmers relative to other actors in a liberalized market setting. Chapter 5 fleshes out the relationship between ancillary chains for risk management (specifically futures markets) and the distribution of income along the coffee commodity chain. The illustration above also indicates the complexity of production and distribution chains, especially when ancillary chains are taken into account. Dicken notes that “Such networks are, in reality, extremely complex structures with intricate links—horizontal, vertical, diagonal—forming multidimensional, multilayered lattices of economic activity (2007, 15).” Again, the reader should keep in mind the fact that reality is much more complicated than my diagram (though “lattices” are evident even here), and that all sorts of other ancillary networks have been left out.
The various nodes along the GCCC differ from one another in several important respects. Smallholders are an enormous group, located almost entirely in the global South, meaning that green coffee production is a highly decentralized process that incorporates millions of individuals and firms. The same cannot be said of the international trading and manufacturing nodes, whose activities represent highly concentrated and rather exclusive processes. International trading in green coffee is dominated by only a few firms—eight firms account for 56% of international trading activity (Ponte 2002, 1108). Coffee roasting and manufacturing is even more concentrated and exclusive—56% of this market is accounted for by only three firms (Phillip Morris, Nestlé and Sara Lee) (Ponte 2002, 1108). Further, these big multinationals all originate from the global North. The retailing, supermarket, café and restaurant nodes are much more decentralized, with supermarkets the most concentrated of this group.

Such high levels of market concentration in roasting and manufacturing (and retailing in the case of supermarkets) suggests differences in power among different actors and thus differing abilities to capture income generated along the chain. Indeed, Ponte notes that, even during the ICA era, producing countries captured only 20% of the income generated along the chain (calculated as a share of weighted final retail prices). Since liberalization, the producers’ share has fallen to 13%. Over this same time period, the share of income retained in consuming countries has risen from 55% in the ICA era to 78% since liberalization (Ponte 2002, 1106). Part of this change may be attributed to the
fact that the ICA, by raising export prices, effectively shifted a portion of income generated along the GCCC from the global North to the global South. Ponte also attributes this change to the fact that roasters and manufacturers, by virtue of their increasing market power since liberalization and their newer focus upon product differentiation, packaging, and branding, are able to keep retail prices relatively stable even when coffee prices decline significantly. “This suggests that not only gross margins—but also profits—have increased for roasters (Ponte 2002, 1107).” Ponte is careful to point out that the gains of roasters have come at the expense of producers.25

That income along the chain is so unevenly distributed may seem surprising given recent studies by the International Monetary Fund (IMF), among others, of the impact of liberalization upon coffee farmers. One IMF study concluded that since liberalization, Ugandan farmers had seen their share in export prices rise as marketing boards were dissolved. Marketing boards often took a huge cut of export prices (more below) resulting in a reduced share of the export price accruing to farmers relative to the share of export prices that producers have received since liberalization.26 The authors note: “The data hence show clear evidence that the share of the world price received by Ugandan coffee farmers has increased significantly in the course of the 1990s. When prices are

25 Or, at the very least, at the expense of producing countries. In some countries, most, or all, of the income shifted towards the global South went to producing country governments and not to producers. In Uganda, for example, the marketing board placed an enormous wedge between export and farmgate prices, with this huge tax captured by the government. In other countries, like India, producers retained a much larger share of export prices. Whether the ICA served to shift income to Southern governments or to Southern farmers, and in what proportion, depends upon the individual country context.

26 Several factors drive a wedge between farmgate and export prices, including: taxes (like those imposed by marketing boards), transport costs (which can be very high especially in very low income developing countries like Uganda), and fraud (domestic traders often capitalize upon the fact that many farmers have little to no access to timely and reliable price information). The IMF study cited above maintains that the tax component of this wedge has decreased dramatically since liberalization, resulting in producers receiving a larger share of export prices.
measured in current US cents (as in Figure 2), our data suggest that this share increased from approximately 15 to about 25 percent between 1992/93 and 1995/96 possibly reflecting the transition away from “guaranteed” prices and the successful adjustment to liberalization (Bussolo, et. al. 2006, 9).”

This finding is not inconsistent with Ponte’s argument that since liberalization producers have received a smaller share of income generated along the chain than during the ICA era. Indeed, the producer share in export prices can rise while share of GCCC income falls in an environment of falling world (export) coffee prices and relatively stable retail prices. This is one important consequence of differently structured markets for washed green beans on the one hand, and processed coffee retail products on the other.

This discussion of the GCCC has illustrated several key points. First, a whole host of different actors participate in coffee production, distribution and consumption, processes that are widely geographically dispersed. Second, ancillary chains link up with the GCCC in various places and in different ways, resulting in very complex “lattices” of economic activity. The structure and accessibility of ancillary chains impacts actors along the GCCC. Third, different nodes on the chain are characterized by greater or lesser degrees of (de)centralization and concentration. Roasters and manufacturers, followed by international traders, operate in a market setting dominated by only a few firms. Producers, as well as consumers, are significantly more decentralized and numerous. Fourth, roasters and manufacturers have a greater capacity to capture income generated along the chain relative to producers as a consequence of greater market, political and social power. While producers may indeed get a bigger share of export
(world) prices, export prices have fallen far enough since the ICA supply controls collapsed so as to actually reduce producers’ share of retail prices (chain income). That roasters are able to capture the gains from falling export prices, not passing these savings along to consumers, is an additional testament to the uneven power distribution along the GCCC. This pronounced unevenness along the chain, in terms of income and power, will form part of the analysis in Chapter 5.

**Characteristics of the global coffee market**

The global coffee market is frequently characterized as having chronic structural imbalances. Over the past century coffee demand has grown slowly and constantly in concert with rising population levels in the global North, and rising population and income levels in the global South. Coffee supply, on the other hand, has grown much more quickly and, absent government intervention, tends to consistently outpace demand on world markets. Charveriat notes that between 1990-2000 coffee production increased at twice the rate as has consumption (2001, 5). Baffes and colleagues attribute recent market imbalances to major expansions in Brazilian and Vietnamese production, combined with stagnating demand in “mature consumer markets” like that of the US (Baffes et. al. 2005, 297). Expanding production in Brazil and Vietnam is usually blamed for the 1998-2002 coffee crisis, in which prices reached 100-year lows.

While overall demand in the global North has been stagnating, there has been significant growth in demand for “specialty” coffees, like organic, Fairtrade and shade-grown (bird-friendly) varieties (Ponte, 2002). Furthermore, Robusta beans are increasingly being substituted for Arabica beans by many larger roasters and manufacturers, leading to different demand paths for each type (and also contributing to
rising corporate profits). While supply controls of previous decades served to separate the prices of Arabica relative to Robusta beans, today the collapse of supply controls combined with improved quality measures on the part of Robusta producers have created a more powerful incentive for substitution. Bates (1997, 20-5) discusses at length the manner in which the ICA (discussed in more detail below) served to prevent “rivalry” among producers of coffees with different quality characteristics, and the competitive price cutting across varieties that has plagued global producer relations since the ICA’s collapse.

Structural imbalance in the coffee market is also related to elasticities of supply and demand. Demand is relatively price inelastic meaning that demand is relatively insensitive to price changes. In contrast, it is relatively income elastic at low income levels, hence the slow and rather constant growth in coffee demand in the global South as income levels rise over time. Crucially, while high prices thus mean much higher revenues for farmers, low prices do not have the typical revenue-augmenting effects. Indeed, the low prices seen in crisis scenarios translate into severely reduced farmer incomes. A recent FAO report suggests, however, that the insensitivity of demand to falling coffee prices is not so much a matter of inelasticity (which speaks to consumer behavior), but rather a matter of asymmetries in the transmission of world coffee price changes to end markets (which speaks to power asymmetries along the coffee commodity chain): “there is some evidence to suggest some asymmetry in price transmission with a tendency for falling world prices not to be passed on but rising prices to be passed on at least to some extent. The implication of this is that final demand does not rise as world prices fall because the price falls are not passed on into final markets (FAO 2003, 8).”
This means that retailers, roasters and manufacturers use their power to maintain and augment profit margins in the face of fluctuating prices.

Supply is also relatively price inelastic in the short- to medium-term largely due to the time it takes coffee plants to reach maturity. David Hallam at the FAO notes: “[F]alling prices do not necessarily prompt the expected supply response. The perennial nature of the crop means that adjustment to the scale of production through diversification and exit from the industry is slow: in the short run the price elasticity of supply appears to be very small, around 0.25. It may also be that, as is often argued for perennial crops, supply responses to price incentives are asymmetric: periods of rising prices stimulate new plantings and other fixed asset investments which are not scrapped when prices fall, but rather are simply not replaced when they reach the end of their productive life (in FAO 2003, 6).” As will be seen in later chapters, this slow and asymmetric supply response to coffee prices casts serious doubt upon the ability of short-run future coffee prices to efficiently direct farmer production and investment decisions.

Agricultural commodity prices (world and farmgate) have generally been noted to be incredibly volatile and coffee prices are among the most volatile of this group. Noting that “coffee prices are highly volatile”, Baffes and colleagues go on to attribute such volatility to the weather in Brazil (Brazil’s production affects global prices), as well as to “short-selling and buying by hedge funds” on futures markets (2005, 300). The graph below illustrates the dramatic booms and busts in coffee prices since the mid-1970s, as determined by averaging the International Coffee Organization’s (ICO) monthly historical indicator price (a weighted measure of 3 types of Arabica beans, and Robusta
beans; these are world prices, with farmgate prices generally lower and similarly volatile).

**Figure 3.3: Average annual ICO coffee indicator price, 1976-2006**

Most troubling, particularly when contextualized in the later empirical analysis, is the specific nature of booms and busts in coffee prices. A 1999 study by researchers at the IMF concluded the following: “First, for the majority of commodities, price slumps last longer than price booms. Second, the magnitude of price falls in a slump is slightly larger than those of price rises in subsequent booms. Third, there is little evidence of a consistent ‘shape’ to the cycles in commodity prices. Fourth, for all commodities, the probability of an end to a slump in prices is independent of the time already spent in the slump, and for most commodities, the probability of an end to a boom in prices is independent of the time already spent in the boom (Cashin et. al. 1999, 4).” The authors later note that coffee conforms to all of these general conclusions (Cashin et. al. 1999, 13-18).
In the context of futures markets (more below), which provide a special sort of price insurance, these findings are quite problematic. That prices slumps last longer and are of a larger magnitude than booms suggests the crucial importance of price insurance in order for farmers to maintain their incomes from coffee over time. Indeed, like many commodities, such evidence suggests a long-term secular decline in coffee prices and the correlate need for long-term, as well as short-term, price insurance. As will be noted at length below, futures markets provide, at best, for short-term coverage.

Further, given that there is little evidence that coffee price cycles fit a particular pattern and that the end of booms and busts seem to exhibit no real pattern at all, it would appear impossible for a farmer to selectively take out price insurance during only those times when a bust is expected.\(^{27}\) Ergo, price insurance coverage likely must be maintained constantly over time if a farmer is to protect against falling prices. As will be discussed in the subsequent analyses, this presents problems from the perspective of income inequality. It also highlights the importance of farmers’ choices about the extent of their coverage. What’s more, volatility of coffee prices casts serious doubt on the ability of future coffee prices, which are to some extent derived from prices in the cash market, to provide appropriate production and investment guidance to farmers. As will be noted in subsequent chapters, futures prices are often as volatile as cash prices.

\(^{27}\)That coffee prices are unpredictable is precisely the motivation behind hedging on futures markets. However, the study cited above about trends in commodity prices suggests something further, namely that it is difficult to form reasonable expectations about future cash prices by looking at historical price trends. Not only is it impossible to say what will happen in the future, on the basis of historical information it is also difficult to say what probably could happen. This makes decisions about insurance timing and coverage difficult to navigate.
Historical efforts to manage coffee price risk

In the 1950s John Kenneth Galbraith described a truism in farming that is especially relevant to the investigation at hand: “For the farmer, protection against a severe decline in his prices was (and remains) of paramount urgency. Such a decline threatens both his income and his assets. After that, depending on the region, comes the danger of drought and crop failure. *There are no other hazards of similar importance* (1998, 91, emphasis mine).” Recent surveys of coffee producers in several countries confirm his assertion (as do the characteristics of coffee prices described in the previous section). In India, producers rated risks on a scale of one to five, five denoting the most severe threat. For all farms, regardless of size, price reductions ranked 4.33 and price instability ranked 4.16. The only risk gauged as a more severe threat was “rainfall/weather”, ranked at 4.68. In Nicaragua, the rankings ranged from one to three (a score of 3 denoting the most severe threat), and the results showed that a fall in international prices was ranked by all farms at a level of 3; weather risk was ranked lower, at 2.19, by all farms (Lewin, et.al, 2004: 29). In Vietnam, surveys of coffee growers conducted by the World Bank’s Commodity Risk Management Group (CRMG) revealed that price risk, along with yield risk, were the biggest concerns among farmers (Giovanucci, et. al., 2004: 51). In Uganda, some 88 percent of surveyed coffee producing households expressed an interest in purchasing formal hedging instruments (put options in this case), indicating that price risk is a significant concern (Fafchamps and Hill, 2007: 11).

It is thus unsurprising that the past century is littered with various attempts to insulate farmers from the risk of falling prices, a risk that threatens incomes and livelihoods. In particular, there are at least two arrangements of interest for this
investigation: public commodity price stabilization and futures markets. Public commodity price stabilization, harkening back to the Brazilian government’s 1906 “permanent defense of coffee”, really came of age in the post-Depression/post-WWII era, an era marked by Keynesian-style market interventions. By the late 1980s, such government interventions had become intellectually passé and political infeasible, a reflection of the global neoliberal resurgence in academia and policymaking that stressed free market economic organization. In the midst of this new environment, researchers and policymakers began to advocate arrangements that would allow coffee farmers to manage price risk *privately*. More conservative, orthodox camps highlight the potential for derivatives markets such as futures to fill the gap left as governments retreated from coffee market intervention. That said, some more radical, heterodox camps orient their research and policy advocacy towards Fairtrade coffee certification, other specialty coffee networks and/or on- and off-farm diversification strategies. All the while, particularly in the wake of price crises, various organizations and policymakers, mostly from the coffee-dependent economies of Sub-Saharan Africa (or organizations concerned thereabout), have pushed for a return to the public interventions of the past. Such counter-hegemonic alternatives are integrated into Chapter 6’s discussion of income security alternatives.

What follows below is a description of these two arrangements and their place in coffee history. Recall that public stabilization’s history provides background for and serves as a jumping-off point for my subsequent discussions of derivatives, for the two are argued by some to be institutional substitutes.
Public coffee price stabilization

Public price stabilization refers to actions taken by government(s) to reduce the volatility of coffee prices and/or augment them. Such efforts generally characterized coffee policy across the developed and developing world from roughly 1930 until 1989, and began even earlier in the case of Brazil. As noted in Chapter 2, public price stabilization arrangements are today frequently criticized by agricultural development researchers and are often used as objects of comparison to futures instruments and other market-based price risk management instruments.

Coffee price stabilization was first attempted in 1906, when the Brazilian government started buying up coffee from its farmers and storing it in public warehouses. The creation of such “buffer stocks” served to reduce world coffee supplies (at the time Brazil accounted for about 70% of world coffee production) and raise prices (for more information on Brazil’s program see: Hutchinson 1909; Talbot 2004; Daviron and Ponte 2005). Given the laissez-faire predilections of many academics and policymakers at this time (see discussions of this period in, e.g., Chang 2002; Kindleberger in Friedan and Lake 2000), it was commonplace for observers to speak out against Brazil’s blatant attempts to interfere with world prices: “The whole experience serves to emphasize the dangers of government interference with industry”, wrote Hutchinson in 1909 (543).

By the 1930s, however, the scholarly consensus had shifted, with researchers increasingly recommending that governments intervene for the purpose of stabilizing commodity prices, much as Brazil had done for the past three decades. Public officials in coffee-producing countries too began to widely support such measures—the Great Depression reduced consumer demand for primary commodities in the developed world,
reducing export earnings and tax revenues for many developing country economies. Primary commodity-producing countries generally began to experience balance of payments and fiscal troubles, and farmers began to experience significant economic distress. This consensus only strengthened in the lead up to and aftermath of WWII, as governments had become accustomed to regulating commodity supplies, prices and purchases in order to fulfill wartime needs.

Recommendations for government stabilization of commodity prices generally fell into two categories, both of which emphasized international cooperation to restrict commodity supplies (which positively affects prices): buffer stock schemes and quota schemes. Various scholars recommended one or the other depending on which objectives they felt were most important for governments to pursue. Buffer stock operations (i.e. public stockpiling of commodities to support prices), often to be carried out by some international commodity organization on behalf of member governments, were more popular among thinkers writing during WWII. One significant benefit to stabilizing prices in this manner was that governments potentially had available to them stocks of primary commodities that could be used during wartime when international trade was disrupted (Keynes 1938). Buffer stocks were also recommended by scholars who were contemplating the post-WWII international monetary order. Quite a few economists during this period suggested merging the desire for commodity price stability with that for exchange rate stability through the creation of commodity reserves to back national currencies, either in addition to or supplanting gold (e.g. Graham 1945; Hayek 1943).

Quota schemes (i.e. limits on exports, and sometimes imports, to support prices) were thought to be better at managing “chronic surpluses” in primary commodities.
While buffer stock schemes actually provided producers with an incentive to produce more as prices rose, causing the fiscal burden on government of maintaining the scheme to increase, quota systems were thought to be better at restricting production and directing agricultural activity towards more efficient areas (Tsou and Black 1944). Most international commodity agreements in existence during the 1940s (e.g. for sugar, wheat, beef, tea and coffee), and indeed most of those that came later, were of this sort. It should be noted that, in practice, international quota arrangements were often complemented by buffer-stock operations at the national level.

While there was certainly diversity in the suggested objectives of commodity price stabilization arrangements, the issue of how price instability affected primary producers seemed almost always to have been a concern. Keynes recommended that England maintain buffer stocks in order to protect farmers from “ruinous price fluctuations” (1938, 453). Hayek writes of the benefits to producers from pursuing a commodity-backed currency scheme: “As in the past gold-mining used to be the only industry that regularly prospered during periods of depression, so the producers of raw commodities might under this plan even enjoy in the same circumstances a moderate increase in prosperity…(1943, 181).” Further, Bauer and Paish maintain that these arrangements were not only designed to stabilize producer incomes: “Although these various measures were often intended to even out temporary price fluctuations, they were usually designed to raise more or less permanently the incomes of producers. It was generally impossible to distinguish between measures designed to even out fluctuations and those intended to raise incomes (1952, 752, emphasis added).”
After several failed attempts by coffee-producing governments to form a production cartel in the 1950s, and in the face of sinking coffee prices, the International Coffee Agreement (ICA) was signed by both producing and consuming nations in 1962. It was renegotiated in 1968, 1976, 1983, 1994, 2001 and 2007. The objective of the ICA was to balance supply and demand of coffee in order to achieve “equitable prices” (Talbot 2004, 58). It should be noted that by this time, world coffee production was significantly more fragmented than it had been in the earlier part of the 20th century. This meant that no one coffee producing country (e.g. Brazil) could have successfully stabilized prices on its own. Further, an agreement that did not also include consuming countries risked failure—the incentive for member producing countries to cheat on their quotas, selling ever more coffee to Northern markets, would have been enormous. It would have also been tempting for consuming countries to look to non-member producer countries, who offered lower prices, to meet their demand.

While there is significant scholarly disagreement as to why sixty-seven countries initially signed onto such an agreement, Talbot argues that at the very least all producing countries “saw the value of restricting supplies in order to raise prices” (2004, 59). It is important to note that keeping prices high helped not only farmers but other members of the coffee sector like seasonal laborers, who had work as long as farmers could afford them, and local millers, who had work as long as prices were high enough to make harvesting worthwhile. Bates (1997) sees the matter a bit differently, arguing that it was Brazil and Colombia, wanting to maintain their dominant market positions, that coerced other countries into signing on after the US agreed to participate in the ICA. Talbot also adds that newly independent countries in Sub-Saharan Africa saw such collective action
as a means of staving off economic exploitation by former colonizing countries (Talbot 2004, 59).

As for the consuming countries of the North, there is a relatively large consensus that the United States was motivated to sponsor such an agreement as part of its Cold War foreign policy—keeping prices “equitable” would prevent communist ideology from gaining legitimacy in the US ‘backyard’, particularly in the wake of the 1959 Cuban Revolution (e.g. Talbot 2004; Daviron and Ponte 2005; Wild 2004; Bates 1997). US world economic hegemony, and the parallel interests of other developed Western states in erecting bulwarks against communist expansion, at least partially explains the cooperation of other importing country governments (the Soviet Union was only party to the 1962 ICA).

The ICA created the International Coffee Organization (ICO) to administer and enforce the quota obligations stipulated in the treaty. Each member country was bound to a set quota (renegotiated with each new Agreement), export quotas for producer countries and import quotas for consumer countries. The goal was to balance supply and demand of coffee such that coffee prices were maintained within an acceptable band of between US$1.20 and US$1.40 per pound (Gresser and Tickell 2002, 17). The ICO issued stamps to each producing country in proportion to their quota allotment. Every crate of exported coffee had to bear a stamp, and only stamped crates were allowed entry by customs officials in consumer countries. The 1976 ICA revised the quotas such that they could be suspended when world prices were high and reintroduced when prices dropped too low. Quotas were suspended from 1976-1980, for example, when a Brazilian frost severely limited world coffee supply.
It was up to each member government to meet its quota obligations, and producing governments met their quotas in a variety of ways. That said, almost all had in place an institution (either state-run or parastatal) that regulated coffee exports, and set the prices to be paid to farmers. In Latin America, *institutos* had arisen in the 1940s to help governments manage their obligations to the US under the Inter-American Coffee Agreement (IACA, a regional precursor to the ICA). In Anglophone Africa, India and Ceylon (Sri Lanka), marketing boards had sprung up in the 1920s and 1930s as the British colonial administration exerted increasing control over coffee marketing. In Francophone Africa, *caisses* were created by the French colonial administration for much the same purpose. These institutions were harnessed in support of the ICA after 1962. Below the term ‘marketing board’ refers to all three of these institutional varieties.

Frequently such institutions would strictly license exporters, or otherwise retain an export monopoly themselves. Further, coffee purchases (from farmers) were usually guaranteed, with prices set by government, and often with government maintaining a monopsony.\(^{28}\) The fact that, on the one hand, coffee farmers were guaranteed that their entire crop would be purchased, and that, on the other governments had strict international export quotas to meet, meant that governments necessarily maintained enormous inventories of coffee.\(^{29}\) It is important to note that the prices paid to farmers

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\(^{28}\) Since the end of the ICA, many producing countries have seen a return of domestic traders and other middlemen whose services were often precluded by marketing board activities. That said, Ponte (2002) suggests that these domestic middlemen will again become scarce, as big international traders increasingly establish partnerships and subsidiaries in coffee producing countries, pushing smaller, domestic competitors to the margins.

\(^{29}\) Planting bans, planting licenses, and other measures were used at various points in time by lots of producing country governments in order to ensure simultaneously that quotas were met and that the scheme remained somewhat affordable for the government. It should be noted that there was substantial diversity.
farmgate prices) were almost always lower than coffee export prices, with marketing boards diverting the difference into (urban) development funds and/or the pockets of corrupt officials. The ICA thus resulted in a two-tiered system of supply control for the purpose of stabilizing and raising coffee prices: national buffer stocks were complemented by international quotas.

The “fall” of the ICA refers to the 1989 failure of member governments to renew the Agreement in its then-current form. The Agreements that followed in 1994, 2001 and 2007 were markedly different from their predecessors, lacking all of the quota mechanisms outlined above. The ICO notes that the negotiations that led to the 1994 Agreement were marked by an “absence of consensus on price regulation…Members concentrated on negotiating an Agreement that did not set out to regulate prices, but to focus instead on other forms of international cooperation (ICO 2007).” The ICO today has no role in determining coffee prices. Its work has been stripped of any market-interventionist content, and focuses primarily on promotional activities (e.g. promoting consumption, better quality, and “sustainable” production), informational and statistical services, limited sponsorship of development projects in conjunction with the Common Fund for Commodities, and research activities.

in the policy specifics as well as in timing and implementation of such measures across countries. In many cases such measures were insufficient, or else absent for a long enough period that substantial stocks were accumulated by governments. The cost of purchasing and storing these often enormous inventories, combined with other inefficiencies in the sector, made such schemes costly, and ultimately in many cases, fiscally unsustainable. For more information, see: Bauer and Paish 1952; Varangis, et al. 2002; Yoshida 1984; Akiyama, et. al 2001. The release of these inventories following the ICA’s quota collapse in 1989 would precipitate a severe decline in world coffee prices, the first of two coffee crises since liberalization of the world coffee market.
Just as disagreement prevails in understandings of the formation of the ICA, so too do scholars disagree about why it failed. The fall of the Soviet Union, argue some, resulted in changing US perceptions about its obligations to Latin American countries—absent the communist threat there was little reason to assist in supporting prices (Wild, 2004). By this reasoning, US exit from the Agreement hastened the price support regime’s collapse. Others suggest that the quota system itself failed as producing countries squabbled over quota levels, and more and more coffee was re-routed through non-member countries at lower prices (Daviron and Ponte, 2005; Daviron, 2002). This smuggling, the US noted, meant that US coffee consumers “were, in effect, being taxed to support a black market in coffee” (Mshomba, 2000: 172). Further, as already noted at the outset, neoliberalism was on the rise, and free market sensibilities had become apparent in both academic and policy circles. The fall of the ICA served to undermine the legitimacy of national level schemes, making them either politically infeasible or fiscally untenable, or both. By the mid-1990s coffee marketing boards and the like had disappeared from the global South.

**Futures markets**

As early as the 1950s, economists and development scholars had begun to levy harsh critiques of public commodity price stabilization schemes. While price stabilization policies would continue uninterrupted for roughly the next four decades, these early dissenters provided the basis for a growing critique of state intervention in commodity markets. Bauer and Paish discuss multiple problems with such public arrangements, most of which can be characterized as efficiency concerns. Efficiency was undermined when stabilized prices resulted in oversupply, as evidenced by growing national stocks
Additionally, low-cost producers were discriminated against through high prices, planting bans and corrupt production licensing procedures (i.e. rent-seeking)—this sometimes also caused political instability, particularly where production of the regulated commodity was the most profitable venture around (Bauer and Paish 1952, 753-4; see also Bohman et. al. 1996). Production costs were effectively raised by forcing farmers to produce below capacity (Bauer and Paish 1952, 753). Bauer and Paish also pay significant attention to the manner in which larger, established, politically influential farmers were able to manipulate stabilization policy to their advantage, and to the detriment of potential entrants to the sector. Friedman (1954) also suggested early on that private savings, rather than public price stabilization, was a more efficient way of dealing with the “producer income problem”. Soon enough, other private alternatives to public stabilization would be put forward.

As stabilization arrangements persisted into the 1960s, 1970s and 1980s, economists became increasingly insistent in their criticisms. McKinnon suggested in 1967 not only the problems with public stabilization but also how risk markets could achieve the same objectives more efficiently: “Such a system [of distant futures markets], fanciful though it may be, seems far better designed to provide effective income stability to primary producers than an agricultural spot price support program which gives no incentive to farmers to alter their planting decisions…Yet, proposals for international (or national) commodity price stabilization always suggest direct stabilization of spot prices frequently requiring coercive production controls, thus making such proposals inherently inefficient economically and unnecessarily complicated technically (859).”
By the 1980s, the scholarly consensus had swung almost completely against public price stabilization arrangements. Certain events also served to reinforce this growing consensus. Particularly important was the successful introduction of market-based reforms in communist China in the 1970s, as well as the 1980s economic collapse of the Soviet Union and its ultimate dissolution in 1991. These events jointly served to undermine the theoretical and political legitimacy of state economic control. Moreover, the 1980s debt crisis in the developing world made economists doubt the efficacy of stabilization schemes that required enormous amounts of public financing. Crucially, “writers began to emphasize the distinction between policies that attempted to change the distribution of prices internationally or domestically with policies of managing uncertainty using markets for price risk (Varangis, et. al., 2002: 4, emphasis added).”

As the McKinnon quote above illustrates, derivatives markets have for some time been thought capable of playing much the same role as public stabilization arrangements and are thought to do so more efficiently. As is noted below, the most consistent advocacy has been from the World Bank. But, advocacy has also come from the agricultural sectors of developed countries. A 1989 report by the United States Department of Agriculture (USDA) is tellingly entitled: “Potentials for Substituting Farmers’ Use of Futures and Options for Farm Programs” (Heifner and Wright, 1989). The USDA’s Risk Management Agency (RMA) strives to educate and assist farmers in using market-based risk management tools. As another example, a British commentator recently stated:

Agricultural derivatives are the way forward. The use of derivatives –futures, options, swaps – and the concept of hedging are not much used in British agriculture… If trade is the new aid then farmers need to be savvy enough to use market tools to cope with
downturns and reassert themselves in the marketplace without the support of subsidies such as CAP [the Common Agricultural Policy]. We call it Smart Finance. The farmer that is smart on finance as well as on fields and food is the farmer that survives (Savoy 2005).

At the World Bank in the early 1990s, a concerted effort began to identify and analyze the appropriate means to deal with commodity price volatility in the developing world without the inefficiencies and government capture by vested producer interests characteristic of stabilization arrangements. Arguably, the Bank today remains the most consistent source of derivatives advocacy in the developing country agricultural context. Gilbert notes in a World Bank book published in 1993 that, “Arguments for stabilizing commodity prices are based on the premise that one or more groups in the economy suffer from the volatility of primary prices either because of uncertainty or because of the possibility of unacceptably low consumption levels. But a number of the stabilization schemes considered [here]… tend to stifle the operation of market mechanisms… (in Claessens and Duncan, 1993: 64).”

Three years later, Bank researchers wrote, “Commodity derivative instruments have several advantages over government intervention in dealing with commodity price uncertainty (Varangis and Larson, 1996: 2).” The authors suggest that price risk management through derivatives markets is superior because it relies on market-, and not government-determined prices; because it shifts risk to entities most willing and able to bear them; because it can be linked to financing, making credit less expensive; and, because it costs less than government programs in most cases (Varangis and Larson, 1996: 13). Elsewhere, World Bank researchers argued “that the rapid development of
commodity price risk markets over the last decade offers promising market-based policy alternatives (Larson, Varangis and Yabuki, 1998: 1).”

Today, The World Bank’s Task Force on Commodity Price Risk Management (ITF) is devoted to supporting the development of market-based price and weather risk management arrangements and focuses largely on commodity and weather (index) derivatives markets. The ITF explains its mission: “With the liberalization of many developing country economies, farmers are not insulated from price risks…Markets that can enable producers and organizations to reduce price risk exist…The ITF aims to increase the capacity of local organizations to access commodity risk management markets (ITF, 2006a: 1-2). In this manner, the ITF recognizes the absence of effective price risk management for farmers in the liberalization era, and recommends that derivatives markets fill this outstanding gap.

By 1998, the United Nations Conference on Trade and Development (UNCTAD) had joined the Bank in calling for market-based price risk management as a superior alternative to government stabilization schemes. UNCTAD recommended that, “Governments should ensure that price and trade policies are consistent with the use of market-based risk management and finance instruments (1998b: 3).” Elsewhere, UNCTAD noted: “As early as the 1970s, UNCTAD studies recognized the potential for market-based price risk management instruments in delivering welfare gains to commodity sector participants (UNCTAD, 2006: ix—state of commodity exchanges piece).”

The FAO’s Committee on Commodity Problems similarly writes, “As a proactive approach for minimizing uncertainty, risk management tools are increasingly replacing
government support programs as an alternative for raising price predictability and enhancing producer income stability…On a national front, institutional development and legislative measures permitting derivatives trading have paved the way for striking success in managing risks and reducing volatility in many developing countries (FAO, 2007b: 1).” The Common Fund for Commodities, an organization within the framework of the UN, has already started funding projects in Eastern and Southern Africa to develop market-based commodity price risk management arrangements. Chapter 2’s discussion of the agricultural development literature also surveys this growing policy trend among researchers from various international organizations.

Last but not least, in the developing countries themselves market-based price risk management has also received growing attention. Brazil has established its own commodity derivatives exchanges that offer coffee contracts, as has India. The governments of Mexico and Brazil operate programs to provide futures and/or put option contracts to farmers. In Uganda, Union Export Services, Ltd. (an umbrella cooperative) has been negotiating OTC put options with international dealers on behalf of their member cooperatives, while in Colombia a large umbrella cooperative is undertaking derivatives trading on behalf of its members. Many other producing countries are similarly engaged in pilot programs, research and policymaking that aim to introduce and strengthen the role of derivatives in the agricultural sector.

At the same time, Fairtrade has arisen as a private alternative to both futures markets and government interventions. Indeed, some observers have called Fairtrade an example of “counter hegemonic networks” that represent “globalization from below” (Raynolds 2006, 180). Advocacy of Fairtrade thus exists in stark contrast to advocacy of futures
markets, with the latter forming part of the agenda of international development organizations, like the World Bank, long considered to be agents of neoliberal economic hegemony. Other risk management alternatives, advocated by various groups, include diversification programs (on- and off-farm) and returns to an ICA-like managed supply scheme. While derivatives are the main object of this investigation, the matter of alternatives will be returned to in Chapter 6.

**On derivatives markets**

As has been seen, futures and other derivatives markets increasingly are argued to be beneficial tools with which coffee farmers might manage the income risks that stem from adverse price movements. This background section aims to explain what derivatives are, the roles they serve in the economy generally and for farmers in particular, and to discuss the growing popularity of commodity derivatives worldwide.

Derivatives are financial contracts. They have earned this name because the value of a derivative (theoretically) is *derived* from the value of some kind of ‘underlier’. Derivatives contracts have underliers ranging from commodities (like coffee or gold) and assets (like stocks), to rates (like interest and exchange rates), debt (like corporate debt) and indices (like the Dow Jones and the Case-Shiller home price index), to economic aggregates (like gross domestic product and non-farm payrolls), to the probability of a certain event occurring (like a snowstorm or a terrorist attack).

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30 This name is somewhat misleading, however. Futures prices frequently serve as “benchmark” prices, which sellers around the world reference in pricing their goods at specific times and places. This implies an opposite meaning to the one embedded in the definition of derivatives. Rather than futures prices being derivative, it is cash prices that are frequently the derivative. The relation between spot and future prices is a matter of significant debate and disagreement among economists and financial experts.
In theory, the value of the derivative is dependent upon changes in the value of the underlier or in the probability of the underlying state coming to be (as in the case of the weather, for example). It is this dependence of derivatives on movements in commodity or stock prices, interest rates or equity indices, the weather or political events that seemingly prompted Peter Bernstein to note that, “Derivatives have value only in an environment of volatility…(1996: 305).” Indeed, if we lived in a static world, where nothing changed at all, derivative contracts would be worthless.

To buy (“go long”) or sell (“go short”) a derivative contract is to place a bet. Instead of betting on NCAA basketball or the Kentucky Derby, the holder of a derivatives contract is betting on economic changes and/or changes with economic consequences—changes in prices, changes in rates, changes in the performance of indices, changes in the creditworthiness of corporations, changes in GDP, and even changes in the weather.

Types of contracts

Notwithstanding the different underliers, derivatives contracts come in some basic and standard forms.

The first pertinent distinction among derivatives contracts are contracts that are exchange traded versus those that are traded over-the-counter (OTC). Exchange traded contracts are standardized ones, the trade in which is regulated by exchanges and clearing houses, among other institutions. Exchanges set down trading rules and match buyers with sellers. Increasingly, exchanges are managed electronically (on electronic trading platforms), such that buyers and sellers are matched via a computer program, rather than
via pit trading which was the norm until very recently.\textsuperscript{31} Clearing houses secure market participants against counterparty risk (i.e. the risk that the other party to the contract will default on his obligation). The subsequent analysis focuses entirely on exchange traded futures contracts.

By contrast, OTC derivatives are ‘custom’ contracts and are generally negotiated between a dealer and a client on an individual basis. Crucially, there is no clearing house in OTC markets to ensure that all parties meet their obligations. Indeed, many of the corporate derivatives disasters, like those of Long Term Capital Management and Enron, have arisen from OTC derivatives defaults.

A variety of derivatives contracts may be traded on exchanges, or OTC, or both. What follows are descriptions of the most common and basic derivatives contracts. Keep in mind that derivatives markets are growing very quickly and rapid financial innovation is the norm. This means that thousands of different contracts exist, making a complete discussion of all of them impossible here.

\textit{Forward contracts} are the most basic form of derivative and they are OTC contracts. A forward contract represents a deal between the buyer and seller in which the seller of the forward agrees to make delivery of a specific quantity of a given commodity at a specific price at a specific time and place in the future. The buyer of the forward agrees to take delivery of that quantity, at that price, on that date, at that location. Crucially, a forward contract entails an \textit{obligation} on the part of both seller and buyer, to make and take delivery respectively, on the terms specified in the contract.

\textsuperscript{31}A useful and entertaining primer on pit trading in commodity futures can be found in the movie \textit{Trading Places}, starring Eddie Murphy and Dan Akroyd.
For example, a coffee farmer may sell forward (or go short) 1000 pounds of mild Arabica coffee at $1.08 per pound, to be delivered to the Port of New Orleans on November 4, 2009. A coffee roaster, looking to buy some coffee in the future, might take up the other end of this contract, going long (buying forward) the precise amount and quality of the coffee specified in the contract. In terms of the betting analogy made earlier, a transaction like this one implies that two bets are being made. The coffee farmer is betting that coffee prices will fall between now and November 4, 2009. The coffee roaster is betting that coffee prices will rise between now and November 4, 2009. As with futures contracts discussed below, no money changes hands at the time the contract is entered into. The contract is worth nothing (zero) at the outset and gains/losses accrue only as prices diverge from the ‘strike’ price in the contract. In the case of futures, brokerage, exchange and clearing fees are levied at the outset (brokers and exchanges play a similar role as the ‘house’ does in any casino), but neither of the two parties to the transaction exchange money when the contract is entered into.

Futures contracts are almost exactly the same as forwards, with one big difference. Like a forward contract, a futures contract entails an obligation to sell/buy a certain quantity of a good, of specific quality, at a specific price, at a specific time and place in the future. Unlike forwards, however, futures contracts are standardized contracts, i.e. they all have the same specifications, and they are bought and sold en masse on organized exchanges. Coffee “C” futures are sold on the Intercontinental Exchange (ICE; previously the New York Board of Trade), and each contract specifies 37,500 pounds of mild Arabica coffee, deliverable to a variety of ports internationally. Coffee futures are standardized such that 5 to 6 trading months are available (depending on the exchange)—
on ICE, March, May, July, September and December. The “trading months” are those months in which delivery of the good can be made and contracts usually expire about 2 to 3 weeks into the delivery month, though futures trading occurs during all months of the year. In gambling terms, the buyer/seller of a March 2010 coffee future is betting today on what the price of coffee will be in March 2010. Crucially, futures contracts for agricultural commodities extend, at most, 12 months into the future. For some metals and energy products, a two year time horizon can be expected. Thus, modern futures markets are broadly considered to be rather short-term, in contrast to the “distant futures markets” that extend many years into the future theorized by thinkers like McKinnon (1967) and Newberry and Stiglitz (1981). This suggests that futures can provide only short-term price insurance.

There are two major derivatives exchanges that offer coffee futures to actors around the globe. I mention these here as futures contracts form the basis for the subsequent empirical analysis. The Intercontinental Exchange (formerly NYBOT) sells futures on Arabica coffee. The London International Financial Futures and Options Exchange (LIFFE, now partnered with Euronext) sells futures on Robusta coffee. Recently, two coffee-producing countries have created their own derivatives exchanges, offering a variety of coffee contracts. Futures, options and mini-futures contracts, on both Arabica and Robusta beans, are traded on the Brazilian Mercantile and Futures Exchange (BM&F). Arabica and Robusta futures are also traded on two Indian derivatives exchanges: the National Multi-Commodity Exchange (NMCE) and the National

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32 Like other parts of the modern financial system, mergers and acquisitions occur frequently among derivatives exchanges.
Commodity and Derivatives Exchange (NCDEX). Futures on Robusta beans only are traded on the Multi-Commodity Exchange of India (MCX). Yet, these new developing country exchanges appear, at least presently, to be limited to domestic participants. The Tokyo Grain Exchange also offers futures on Arabica and Robusta coffee, but trading volumes are quite limited and the Tokyo exchange does not have the global clientele or reputation of the New York and London markets.

*Options contracts* are the last of the most common and basic derivatives contracts. Options give the buyer the *right*, but not the obligation, to buy/sell a specific amount of some good at a specific price at a specific time and place in the future. Options may be exchange traded or OTC. *Put* options are options to *sell*. Someone who buys a coffee put option (or, is *long* a put option) has the right, but not the obligation, to sell a specific amount of coffee in the future at a specific price. *Call* options are options to buy, and they give the person who buys it (or goes *long* a call option) the right, but not the obligation, to buy a specific amount of some good at a specific price in the future. The individual who sells, or goes short, the put or call option can also be said to have “written the option”. The seller (or writer) of the option receives a premium from the buyer in exchange for taking on the risk that the buyer will exercise. Unlike forwards and futures then, the amount of the premium is exchanged as soon as the contract is entered into (the buyer is getting a privilege that parties to futures and forwards do not—the right to sell/buy without any obligation to do so). To “exercise” an option is to assert one’s contractual right to buy or sell according to contract terms. American options may be exercised at any time up until the date of expiry specified in the contract. European options may only be exercised on the expiration date.
While forwards, futures and options are the most basic and most widely utilized derivatives contracts, there are a few more complex and sophisticated instruments that are worthy of note. *Swaps* are agreements to exchange a set amount of one good for a set amount of another good at some time in the future. Foreign exchange swaps are among the most common, as are interest rate and corporate default swaps (as the recent housing market crisis in the US has miserably highlighted). *Swaptions* are hybrid instruments that give traders a right, but not an obligation, to swap sometime in the future—they are options on swaps. Derivatives or “derivative-like features can also be blended either with other derivatives or with commodities or assets” (Bryan and Rafferty 2005, 47). Convertible bonds, for example, give the holder the option of converting the note (debt) into an equity share (stock). In another instance, back in the 1990s, JP Morgan issued P.E.R.L.S., or principal exchange rate linked securities, the payouts on which were linked to the movement of the Thai baht (see Partnoy 1999 for more information). These instruments looked like bonds, but acted like derivatives.

**The functions of derivatives markets**

Usually, discussions of derivatives markets focus on two distinct functions that these markets fulfill: price discovery and risk shifting. I address each in turn.

**Price discovery**

Price discovery refers to the process whereby a futures market ‘discovers’, or predicts, future prices, via aggregating the future (price) expectations of traders—for this reason futures markets are sometimes called prediction markets. As will be discussed below, future price expectations are generally developed by traders using one or both of two main methods. In theory, such future discoveries allow cash market participants to
transact and make investment decisions efficiently on the basis of ‘rational’ forward
prices—they have a glimpse of what the future holds and can thus make decisions with
more certainty.

Speaking of price discovery in futures markets, Hermann notes that, “The market’s
basic role is to provide rational forward prices (in Claessens and Duncan, 1993: 427).”
Put differently, the “futures price can be considered as an unbiased prediction of the
subsequent spot [cash] price" (Stennis, et. al., 1983: 308).” As Schultz elegantly noted
back in 1949, prices (cash and future) may be thought of as “production guides” from the
perspective of farmers (1949: 1). Along these lines, Herrmann writes of the benefits of
price discovery for both producers and consumers in commodity markets: “Forward
prices for the commodity guide sales negotiations as well as decisions about resource
allocation (in Claessens and Duncan, eds., 1993: 428).” Future prices serve as maps of
sorts for producers and consumers alike, relaying information about expected future
supply and demand conditions in the underlying cash market. Such information may
impact a farmers’ decisions about planting, harvesting, marketing and storage, among
others. Indeed, future prices are thought to allow some certainty about the future to
trickle down to the present, eliminating some of the uncertainty that generally
characterizes farming enterprises (at least for the time period covered by contracts for
which trading is relatively liquid).

Crucially, the benefits of price discovery are thought to accrue to derivatives market
participants and non-participants alike. Even if a farmer cannot access the futures market
per se (i.e. to manage risk, see below), she may still reap the efficiency gains of futures
trading in that her business and investment decisions will be better directed when future
prices are used as a guide. This argument will be addressed mainly in Chapter 5.

The reader should be aware that while the language of ‘discovery’ implies some sort
of scientific unearthing of ‘true’ prices, in reality the situation is not nearly so neat. Later
chapters will discuss some recent problems with futures market predicting future cash
prices. Further, if cash prices are derived from futures prices, and not vice versa as
orthodox theory contends, then futures prices will \emph{ipso facto} always be accurate
predictors of cash prices via the mechanism of self-fulfilling prophecy (i.e. futures
markets predict ‘x’; cash market participants act as if ‘x’ is true; and, lo and behold, ‘x’
comes to be. This is much the same as in foreign exchange and stock markets, where
investor activity brings to fruition the very state that investors expected; see, e.g., Keynes
1997). In this case differences in cash and futures prices (i.e. predictive inefficiencies)
would not be traced to some sort of disagreement about market fundamentals or the
activities of institutional investors (as they frequently are now), but rather to the fact that
a significant portion of coffee market actors don’t use future prices as a guide (maybe,
e.g., because there is no ticker that relays future prices in most rural areas) or that
different people interpret the same information in different ways.

\textit{Risk shifting}

As the statement of Bryan and Rafferty at the outset of this chapter suggests,
derivatives markets also serve to \emph{price} risks associated with changes in the values of
underliers. This means that risks can be bought and sold, or shifted, to market
participants who are better able and/or more willing to bear them. Risk shifting serves
two general purposes: speculation and risk management or hedging.
Speculators in derivatives are individuals who bet on the movements of underliers without actually owning (or wanting to own) the underlier itself—they buy up risk that others want to get rid of. They bet on price changes, index movements, and on event probabilities. That derivative instruments allow participants to extensively leverage their positions has increasingly lent them to this sort of activity. Leverage refers to the fact that traders can play in derivatives markets by offering up only a small proportion of the value of their transactions at the outset—a small initial outlay can potentially yield exponentially larger gains in the end. Bryan and Rafferty explain: “Leverage also facilitates people with no direct interest [in the underlier] per se to become involved in the market…it is the capacity to obtain exposure to a much greater amount of a commodity, or financial asset, for little investment, and with no necessary interest in the underlying commodity or asset that concerns many worried about their explosive potential (2005, 43).” Indeed, observers of derivatives-based corporate failures note that the small size of the initial outlay masks sizeable liabilities should the bet be lost, resulting in very fragile financial structure with potentially catastrophic consequences should it collapse (see, e.g., Dodd and Hoody 2002; Dodd 2005).

On the other hand, different observers contend that leverage, and the speculative activity it encourages, is actually a good thing, and not a reason for concern at all. Speculators add liquidity to derivatives markets, allowing for trades and prices to be realized that would otherwise be too costly or impossible. Peck explains: “Conceptually, a futures market could exist with trading restricted to commercial firms…[but] like cash markets, such a market would often be extremely illiquid. The noncommercial participants in futures markets—speculators—absorb the frequently unbalanced demands
Hedging, a form of risk management, is the other major purpose of risk shifting. Hedging refers to the process whereby a participant in the cash market (underlying market) takes an offsetting position in the futures market, in order to insure against changes in the value of the underlier. Such positions, as Peck notes above, are called “commercial” positions in the futures market. In the case of coffee, any party that owns coffee, or will own it in the future, is a potential commercial participant in the coffee futures market. Peck asserts that, “Ownership, either actual or prospective, is speculative” (1985, 25). Planting coffee trees, or owning coffee trees, is a speculation on the future price of coffee—farmers are “long in the field”. Hedging aims to balance such speculation in derivatives markets, allowing farmers to be “short in the futures market” as an example.

Peck distinguishes between three different types of hedging. Arbitrage hedging “focuses on seasonal storage of an agricultural commodity and the use of futures markets to secure a return to storage through a predictable change in the relation between cash and futures prices (Peck 1985, 14).” In other words, hedging allows for intertemporal arbitrage. Operational hedging involves the “use of futures as a substitute for an actual purchase or sale of a commodity, normally for a very short period to give a firm the time required to assemble the desired commodity on terms suitable for the contract”, and was recognized first by derivatives guru Holbrook Working (Peck 1985, 17).
But, it is *anticipatory hedging* that is of greatest interest for the subsequent analysis. This is the process whereby futures are used “to price today an anticipated purchase or sale of the commodity that cannot be carried out today in the cash market” (Peck 1985, 19). In other words, a coffee farmer that hedges using futures contracts fixes today the price of coffee to be sold a future date, thereby (all else equal) neutralizing the risk of adverse movements in coffee prices in the cash market (and also eliminating the possibility of additional gains). A similar operation might be carried out by a coffee roaster or manufacturer who anticipates buying a given quantity of coffee in the future and is fearful that prices will rise in the interim.

It is clear, then, why futures markets advocates have associated hedging operations with the tasks previously performed by the ICA, marketing boards, *institutos*, and *caisses*. Both of these arrangements, public stabilization and hedging, theoretically serve to insulate farmers (and other actors) from adverse price movements by *fixing* prices. However, whereas public stabilization accomplished this by manipulating conditions in the cash market (supplies), futures markets theoretically enable this to be done without interfering with free market operations. Rather, prices are fixed by precisely timed participation in supporting markets.33 Or so the argument goes. This functional similarity, with public stabilization and futures markets similarly providing price protection to farmers, is one aspect of these arrangements that has lead researchers (like

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33 Of course, it might be objected that futures and other derivatives markets are not merely the supporting cast. I do not disagree. In some instances, instances that appear to be increasingly frequent, derivatives trades have no link to cash markets, and instead have a life of their own that is independent of the markets from which they are theoretically derived. This is arguably the import of growing levels of speculative activity. Yet, I am reluctant to concede that futures markets are part of a “fictitious” economy with no link to the “real”. That coffee farmers look to the futures markets in New York and London when they sell their crop is one indication of substantial ties between productive sectors of the economy and speculative (“unproductive”) finance.
those I cite above in the historical discussion) to systematically compare them. I also briefly compare the two arrangements in Chapter 6.

**Clearing and contract settlement**

Exchange-traded derivatives contracts are cleared via the exchange’s clearinghouse. The clearinghouse facilitates and administers payments and debits among market participants. While it has not always been the case, today almost all accounts are settled daily. This is called “marking-to-market”. At the end of every trading day each account is marked to market, with gains credited or losses debited. In order to ensure against default, clearinghouses require that each trader maintain a “margin account”. The “initial margin” is simply a good faith deposit made prior to beginning trading. The amount is specified by the exchange and is usually about 3-10% of the value of the contract (this is precisely the degree to which positions are leveraged, as discussed above). Each time the margin account balance falls below the “maintenance” level (which may be the same as or less than the initial margin), the trader must deposit funds to bring the account balance back up to the maintenance level. This is referred to as a “margin call”. Coffee futures traded on ICE require a US$2500 initial margin.

A farmer who sells short (bets that prices will fall) in an environment of rising future prices, as an example, may have to make margin calls daily. The size of each day’s call would be the daily change in the futures price multiplied by the quantity of coffee specified in the contract, and would be made each time the account falls below the maintenance level. Margin calls, in addition to the initial margin deposit, can be costly for market participants and are sometimes a financial impossibility. Recently, the Commodity Futures Trading Commission (CFTC), which regulates US derivatives
markets, has expressed interest in ensuring that sufficient financing is available to allow farmers and other small traders to make their margin calls on credit. The ITF has also begun to investigate the potential for developing country banks to incorporate the cost of margins and margin calls into the loans they sell to coffee farmers. In Chapter 4 I detail the impact of margin calls on farmer incomes.

Exchange-traded agricultural commodity futures contracts can be settled in four different ways: physical delivery, exchange of physicals (or actual), offsetting trade and cash. Not all exchanges will allow for all of these methods of settlement; the contract specifications available for each product offered by a given exchange delineates the allowed settlement methods. Note that more settlement options are available in practice for commodity contracts than for financial contracts (like interest rates, forex, etc.) because there is a possibility of delivery.

Physical delivery, perhaps the most intuitive settlement method, refers to the settlement of a futures contracts via delivery of the good specified in the contract. Each exchange specifies those ports where deliveries are accepted, and short sellers must give notice of delivery to the exchange before shipment.

Exchange of physicals (or exchange of actuals) refers to the process whereby “two traders agree to a simultaneous exchange of a cash commodity and futures contracts based on that cash commodity (Liaw and Moy 2001, 281).” This procedure is almost identical to physical delivery, with the exception that the exchange does not intermediate the delivery and acceptance of the commodity. The two parties who agree to the exchange simply notify the exchange of what has transpired, and the exchange closes the accounts of both traders. For example, let’s say I am a coffee farmer and have sold one
future on ICE for delivery in September 2009. Sometime in early September 2009, I start thinking about how to close out my short position. Great news! I know a local trader who has gone long one September 09 future on ICE. I deliver my coffee to the local trader, who takes delivery of my coffee and pays me at the settlement price for that day. Then we both notify the exchange of the transaction which serves to close both of our positions (I agreed to sell and I did; the trader agreed to buy and he did).

Cash settlement simply means that the two parties to the futures contract settle any losses or gains, as well as delivery/acceptance of the underlier, in cash. Both physical delivery and cash settlement are used only rarely (Liaw and Moy 2001, 281).

An offsetting trade, by far the most common method of contract settlement, requires that a trader make a transaction opposite to the position that is open. For example, a farmer who has sold one coffee future can settle her account by buying one future, making her net position zero. The farmer captures the gains or losses that accrue due to future price changes from the time the future was sold until the time it is bought back. The farmer would then go and sell her crop in the local cash market. Consistent with this most common of settlement practices, all trades in the subsequent empirical analysis are settled via an offsetting trade.

For further information on the mechanics of trading, please consult the Appendix which illustrates the various strategies I employ in Chapter 4 step-by-step.

**The theory and behavior of future prices**

The behavior of future prices bears directly upon the income benefits from hedging for farmers. Of all the terms used to generally describe future prices, “volatile” is likely used most frequently. As will be seen in the next chapter, future price volatility can and
does destabilize income from hedging along several lines. Future price volatility can be a destabilizing force for incomes because, among other reasons, farmers have to make margin calls to address intra-day and inter-day volatility even when the overall, longer term trend in future price is a downward one. Volatility is also problematic in terms of farmer decisions about when to perform various rollover operations and close out hedges for good. Indeed, as I will explain later, volatility gives these choices weight and significance in income terms. While these income effects will be examined in more detail in the next chapter, here I briefly explain how theorists model future price behavior, the different methods used to develop future price predictions, and the behavior of coffee future prices in particular.

**Future price behavior, in theory**

Futures market theorists offer the “efficient market hypothesis” and the “random-walk hypothesis” as models of future price behavior. The efficient market hypothesis states that future prices reflect all information available at any given moment “as well as all events expected to occur in the foreseeable future”, and adjust instantaneously to the arrival of new information (meaning that there are no arbitrage profits possible and no private information) (Teweles and Jones 1997, 107-9). If the hypothesis is accurate, future prices will conform to what statisticians call a “random walk”. Urging caution, Teweles and Jones write that, “There is almost as much debate about this hypothesis in the financial community as there is about religion among theologians (1999, 107).”

There are strong, semi-strong and weak versions of the hypothesis, with the strong versions arguing for higher levels of informational efficiency in the markets. Beginning with the latter, the weak efficient market hypothesis suggests that future prices
incorporate all historical price information. The semi-strong version argues that future prices incorporate all historical price information, as well as “all published information”. The strong version argues that “prices reflect all information that can be acquired, even by hard-working imaginative researchers” (Teweles and Jones 1999, 108-9).

Each of these versions has different implications for the ability of traders to form reasonable expectations of future prices and to profit from futures trading in the short-run. The weak version suggests that traders can make short-run profits based on predictions of short-run future prices that incorporate more than historical price information. The semi-strong version suggests that traders can profit by incorporating more information into their predictions than is given by historical prices and current publications. The strong version yields the most cynical outlook on the ability of traders to consistently make short-run profits and suggests that future prices are unpredictable no matter what information is used. It implies that there is nothing that traders can do to gain an edge in the market.³⁴ Advocates of the strong version often come up against serious criticism—for futures traders do indeed make short term profits. A “die-hard efficient market apologist” might reply, write Teweles and Jones, that: “if enough monkeys were chained to enough pianos for long enough, one of them would eventually compose a sonata” (1999, 109). This suggests the impossibility of replicating short-run, profitable trading strategies. A profitable decision made yesterday will not likely be profitable today. If it is, it is a matter of sheer luck.

³⁴ This suggests that future price changes are entirely random, conforming to what statisticians call a “random walk”.

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Yet, there is some evidence that reality is likely somewhere between the strong and semi-strong version. While prices do appear to take into account all published information and to react very quickly to the arrival of new information, “numerous studies have shown that corporate insiders—those privy to nonpublic information—have earned excess returns [in stock markets]” (Teweles and Jones 1999, 125). Even if such insider information was proven to have similar effects in futures markets, it remains that coffee farmers in the developing world would not likely be among those privy to such information.

This suggests that short-run price movements in futures markets are very close to being completely unpredictable, even probabilistically so. This has serious implications for some of the short-term decisions that coffee farmers have to make about their hedge if and when they trade. In particular, making the “right” choice about when to roll contracts over and close out hedges becomes more a matter of chance than educated forethought. Further, this implies that it is difficult if not impossible to predict how much financing will be needed in the short-run (day-to-day) to cover margin calls. Even further, short-run price fluctuations that are unpredictable would serve to complicate efforts to effectively create a family budget. How much should a family eat today, given its rather uncertain financial position tomorrow?

However, “It is generally agreed that the fundamental laws of supply and demand determine the long-run price behavior of futures (Teweles and Jones 1999, 108).” Supply and demand for futures contracts in the longer term depends on many factors including trader expectations about future trends in the cash market, and the availability and cost of storage. Fundamental analysis of supply and demand and technical analysis of historical
price dynamics may, thus, result in the formulation of longer-term profitable hedging strategies. While traders may not necessarily know how the strategy will perform day to day, due to unpredictable price changes, traders may be able to more accurately forecast longer-term trends.

This gives a bit of room for hope for coffee farmers. Many of the strategies that I devise in the subsequent chapter are longer-term hedges, ranging from one to four years in duration. It thus stands to reason that while short-run prices are unpredictable for coffee farmers, who likely have no inside information, long-run price trends are at least probabilistically knowable. Longer term hedges that rely upon broader market trends for their overall profitability are thus appear more likely to yield reliable and consistent profits than short intra-day or inter-day trading strategies.

That said, a futures trader recently noted that: “In moving from trading the markets in the short run to taking positions to profit from expected trends, the trader should realize that the work in this area affirms that, generally speaking, the market does not habitually shower loose dollars on the casual trader who plays the game. As someone remarked, a trader will have to leave his mouth open a long time before a roast pigeon falls in (in Teweles and Jones 1999, 136).” This is especially because the distribution of future price changes according to a variety of statistical studies is non-normal (Kolb and Overdahl 2006, 137).³⁵ It appears that caution, careful analysis and lots of information are important prerequisites even for taking longer-term positions in futures markets.

³⁵ The distribution of future prices changes is thought by many statisticians to be “leptokurtic”, i.e. exhibiting a high peak and fat tails relative to a normal distribution. This is because there are more extreme observations than found in normal distributions. Further, while future price changes are autocorrelated,
One more theoretical point deserves mention. The relationship between cash (spot) and future prices is a matter of significant debate among theorists. As the names of the instruments imply, it is frequently assumed in standard models that future prices are ‘derived’ from cash prices, but that cash prices are not impacted by future prices—i.e. it is assumed that future prices ‘lag’ spot prices. Kolb and Overdahl note that, “While not quite unanimous, the weight of evidence seems to suggest that futures trading does not increase the volatility of the cash market (2006, 139).” In the over 25 studies that they cite on the matter, only one found commodity cash prices to be more volatile after the introduction of futures trading on that commodity (this was the case for cattle futures). Unfortunately, none of these studies discusses the coffee markets.

If, however, future prices determine cash prices to some degree hedging loses some of its allure. Indeed, the very act of shorting futures may, in aggregate, be sufficient to drive cash prices down in a Keynesian-esque destabilizing, self-fulfilling prophecy. What’s more, activity in futures markets would then be seriously detrimental to those who cannot participate therein due to access related obstacles (more in Chapter 5). While participants have a hedge in place to protect them from price declines, nonparticipants are left to face declines in coffee prices that they had no role in bringing about without an insurance mechanism in place.

Despite assertions to the contrary, there is some limited empirical and anecdotal evidence that futures prices do indeed negatively influence cash prices—i.e. that futures prices ‘lead’ cash prices. “Claims that futures trading may accentuate price fluctuations

meaning that a rise in prices at t0 is usually followed by a rise in prices at t1, it is not a strong enough correlation to yield profitable trading strategies (see Kolb and Overdahl 2006, 137-8).
in the spot market are frequently echoed in various forums, particularly when there has been some sort of financial crisis (Silvapulle and Moosa 1999, 176).” Studies examining the “lead-lag” relationship between spot and future prices are numerous. Garbade and Silber (1983) examined the markets for wheat, corn, oats, frozen concentrated orange juice, copper, gold and silver. They found evidence to support a feedback loop of sorts between the spot and futures markets, with futures market “dominating” but the spot market also contributing to trends in the futures markets (Garbade and Silber 1983, 289). Silvapulle and Moosa (1999) review numerous studies, especially on markets for oil and related products. They note that overall a “bidirectional” relationship between spot and future prices can be empirically supported in numerous commodity markets (1999, 179). The reader should note that the existence of a bidirectional lead-lag relationship does not necessarily imply increased cash market volatility. It does imply however that a mechanism exists in many commodity markets that could allow future price volatility to bleed into cash markets.

Mohan’s (2004) study of the predictive efficiency of the NYBOT and LIFFE coffee futures markets indicates that futures prices lag spot prices most of the time, though not all of the time (i.e. “are adaptive” to them, in Mohan’s language). He further suggests that in the future, given increasing trading activity in these markets, futures markets may come to play a stronger “predictive” role (i.e. a ‘lead’ role) (Mohan 2004, 1000). Even further, there is anecdotal evidence that suggests that coffee farmers around the world are increasingly looking to futures prices as “reference” prices when they sell their crops (World Bank 2005). Systematic evaluation of the relation between spot and future coffee
prices appears to be an important avenue for further research, especially given the potential policy relevance of the findings.

**Future price behavior, in practice: forecasting, volatility and speculative activity**

As mentioned above, there are two general methods employed by futures traders to develop future price predictions. These techniques represent different stances on the question as to what extent the past determines the future. However, neither of these modes of analysis can consistently and probabilistically forecast future prices to any great degree across different markets and periods of time:

It should be realized at the outset that of all games played, the futures market is certainly among the most difficult. Prices respond in often unpredictable ways and to varying degrees to a huge number of unpredictable events. Given the variation in both the inputs and the reactions to the inputs because of different amounts of discounting by the markets, it is obvious that the inputs are basically erratic and thus create a game *not based purely on skill or laws of probability*, resulting in extremely difficult analysis. Many strategies can be used in different futures markets under varying conditions over different periods and may succeed some of the times and fail at others (Teweles and Jones 1999, 105-6, emphasis added).

“Fundamental” analysis, which involves looking at supply and demand conditions in the futures market (which is to some extent based on cash market trends) to form expectations about future prices is most common among commercial players.

“Commercial” traders are actually involved in the cash market and thus have firsthand knowledge about market fundamentals.

Speculators (non-commercial traders), whose presence in futures markets has increased significantly over the past several decades, tend to base trading on technical analyses of current and historical price trends. A recent observer notes: “This fantastic system of side bets is not based on old-fashioned human hunches but on calculations designed and monitored by computer wizards using abstruse mathematical formulas…”
developed by so-called quants, short for quantitative analyst (*Time* magazine in Bernstein 1996, 304).” Bernstein issues a word of caution to those adopting such technical analyses: “Those who live only by the numbers may find that the computer has simply replaced the oracles to whom people resorted in ancient times for guidance in risk management and decision making (Bernstein 1996, 336).” Newberry and Stiglitz also question such methods, arguing that assuming that future prices can be predicted by looking at historical prices is “somewhat questionable”, in particular “if the exogenous shocks, which gave rise to variability [in the past] were in fact uncorrelated over time” (1981, 239). Putting aside global warming trends, the weather’s impact on coffee production and prices may be considered to be one such historical stream of uncorrelated, exogenous shocks.

Such technical, computerized strategies can potentially breath serious inefficiencies into the predictive capabilities of the market. Mohan 2004 argues that futures prices deviate from spot prices in coffee futures markets on the order of 30% (see also Domanski and Heath 2007 for similar commentary; see also Chapter 5). Moreover, they can also result in large and sudden fluctuations in prices. Talbot explains:

A forecast of cold weather in the coffee growing regions of Brazil, possibly portending a damaging frost, might set off a wave of buying by fundamental analysts, raising the price. The surge in volume and price could trigger a wave of buy orders from the technical analysts, who often had their computers set up to issue an automatic buy or sell order if market trends met certain conditions. Then, a couple of large speculators who decided to sell their contracts to take a quick profit might trigger a wave of sell orders, driving the price back down. A market movement like this could easily take place in the course of one trading day… (2004, 112).

Put differently, the growth of speculative activity, combined with different modes of analysis and information sources, has resulted in more volatile future coffee prices. As
one trader recently put it, “The coffee market is no place for the underfinanced or the timid (in Teweles and Jones 1999, 578).” The ICO itself similarly suggests that surges in institutional speculation may be responsible for more volatility in coffee future prices (2005).

The role of speculators in futures markets is highly controversial. While some condemn speculative activity for making prices more volatile (like Talbot above), others suggest that speculative activity is a necessary condition for the effective functioning of the market. As noted above, Peck (1985) maintains that speculators add liquidity to the market, allowing trades to be made and prices to be reached that would not be possible if only commercial traders were participating.

Another more dramatic variant on this argument was recently presented by the Center for Futures Education: “Market participants who buy or sell futures contracts in an attempt to earn a profit (speculators) are benefiting society by supplying the economic goods at a market price when they are needed. Without such a service, supplies could dry up and prices would be determined less efficiently (read: more price volatility). In short, they supply the capital that is the lifeblood (liquidity) of the markets, and they assume the risk that hedgers want to transfer. Society, as a whole, benefits from the greater market liquidity that speculators provide for all economic goods (2008).” As such statements illustrate, the role of speculators and their impact in futures markets are not matters that are widely agreed upon.

As an indication of the extent of speculative activity in coffee futures markets, below I show the amount of coffee actually grown in the world in 2007 relative to the amount of coffee traded on the New York and London futures exchanges that same year. The large
discrepancies seen below, with coffee traded on futures exchanges amounting to about 17 and 10 times the amount of global production for ICE and LIFFE respectively, gives a sense of the size of speculative activity. Indeed, coffee futures markets are increasingly a place where “men who don’t own something are selling that something to men who really don’t want it” (Tickell 1999, 249).

**Figure 3.4: Global coffee production relative to coffee traded on futures exchanges**

<table>
<thead>
<tr>
<th>Type of Coffee</th>
<th>Quantity grown globally (2007) (estimated; in lbs)</th>
<th>Quantity traded on futures exchanges (2007) (estimated; in lbs)</th>
<th>Factor by which futures quantity exceeds quantity grown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabica</td>
<td>10,705,992,000</td>
<td>184,492,687,500 (ICE Coffee “C” contracts only; volume from 1/2/07-11/30/07)</td>
<td>17.2</td>
</tr>
<tr>
<td>Robusta</td>
<td>4,588,320,000</td>
<td>48,793,723,000 (LIFFE 5 tonne Robusta coffee contract only)</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Talbot, offering similar figures for an earlier period, argues: “If futures contracts were being traded simply to hedge purchases of physical coffee, then total futures volume would be expected to be about two times the volume of physical coffee traded, assuming that they buyer and the seller in each purchase fully hedged their positions (Talbot, 1997: 111).” This is not the case, however. Talbot states: “[T]he total volume of futures traded exploded from five times the volume of physical coffee in 1980, and to nearly ten times the volume in 1994… (Talbot, 1997: 111).” He further notes that if options contracts are added into the mix, in 1994 futures and options contracts traded amount to about 15 times physical coffee production (Talbot, 1997: 111). Among other things, these data suggests that no matter how many hedgers entered futures markets in the future,

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36 Data from the ICO, LIFFE and ICE
speculative activity would still be the dominant force. This means that even if all farmers could access futures markets (see Chapter 5), future price volatility would still be a reality and may serve to undermine the income benefits of hedging (see Chapter 4).

**The rapid growth of derivatives markets**

While derivatives certainly have a long history, it is only recently that their growing popularity has begun to capture significant international attention, and for good reason—the pace of growth and the sheer size of derivatives markets today are simply breathtaking. In 1986, the total outstanding value of derivatives markets was US$1 trillion. By 1994, this figure was US$20 trillion (Bishop, 1996; see below for discussion of this measure of market size)—a 2,000 percent (nominal) increase in just eight years. The table below illustrates derivative market growth for exchange traded futures and options and OTC derivatives combined from 1998 until 2006, a period that also witnessed phenomenal market growth.
The table above illustrates that in just eight years the size of exchange-traded futures and options markets and OTC markets combined has increased by over 400%. At year-end 2006, the size of these markets combined was just under US$500 trillion. By comparison, according to the World Bank the gross domestic product (GDP) of the whole world in 2006 was just over US$48 trillion.

The measure used above to determine derivative market size is “notional amount outstanding”, referring to the aggregated value of the underliers (e.g. commodity, currency, rate, index, etc.) specified in the contracts. Put differently, the International Swaps and Derivatives Association (ISDA) defines ‘notional amount’ or ‘notional principal’ as “a hypothetical underlying quantity upon which interest rate or other payment obligations are computed.” In the case of interest rate and other purely financial derivatives, the underlying quantity is indeed hypothetical as these contracts are only settled in cash, with no prospect of actual delivery (imagine the difficulty in delivering,

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37 Based on Bank of International Settlements (BIS) data.
for example, the basket of stocks required to settle a contract on the Dow Jones Industrial Average). In the case of commodity derivatives, particularly on storable commodities (like coffee, precious metals, oil, etc.), delivery may be (and sometimes is) made and the underlying quantity is thus part real and part hypothetical. The ability to cash settle and to settle via offsetting trade in commodity markets is the mechanism that allows the quantity of a good traded in futures markets to so greatly exceed the amount of the good that is actually produced globally. Put differently, cash settlement and offsetting trades allow for non-commercial participation and exponential market growth beyond the limits set by global production levels.

Notional amount outstanding is not a measure of how much money actually changes hands between traders in derivatives markets. Recall that it is a characteristic of derivative instruments to enable investors to acquire huge amounts of leverage, which means that the value of one’s transaction is much more than the amount one pays to enter into the transaction. “Gross market value” measures the actual amount of money that changes hands in derivatives transactions. At year-end 2006 according to the Bank of International Settlements (BIS) the gross market value for global OTC markets was just under US$10 trillion, a mere fraction of the total value of the underlying principal of the contracts. Gross market value data was unavailable for exchange traded derivatives markets.

While the most notable growth has been in financial derivatives markets38, commodity derivatives markets have also been expanding quite rapidly. The Futures

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38 Agricultural contracts accounted for just over 5% of contracts traded globally as of early 2008. According to these same figures from the FIA, equity, equity index and interest rate derivatives account for
Industry Association (FIA) reports that in 2007 global trade in agricultural commodity futures and options grew by 32%, aided by electronic trading, high oil prices, trade in biofuels, and “stronger interest among institutional investors (Burghardt 2008).

Calculated by volume, the number of agricultural futures and options contracts traded globally increased by almost 80% during 2007. FIA data indicates that exchange traded agricultural commodity futures and options volumes have grown about 600% since 1998, rising from roughly 138 million contracts traded worldwide in 1998 to roughly 646 million contracts in 2007.

While some of this growing demand can be traced to new and larger commercial positions (i.e. participation by firms actually involved in the coffee cash market) looking to hedge in an increasingly volatile price environment, much of this upward trend has been traced to the rapid entrance of hedge funds, managed funds, and other financial institutions into the markets. The Wall Street Journal explains:

The commodity futures markets play a key role in establishing worldwide prices for wheat, corn, soybeans and other foodstuffs, as well as energy products like crude oil and natural gas. But in recent years, these markets have also become an attractive haven for investors seeking profits from rising commodity prices and protection against inflation and a withering dollar. As a result, billions of dollars have poured into the commodity futures market - from pension funds, endowments and a host of other institutional investors - through the new conduit of commodity index funds. Billions more have come in from investment banks that are hedging the risk of complex bets, called swaps, that these same investors have made in the unregulated international swaps market (“US plans tougher rules on commodities” 6/4/2008).


The influx of such speculative activity has been so overwhelming that the usually rather ‘hands-off’ CFTC has begun investigating new rules for speculators designed to curb their destabilizing influence on futures prices and hedging operations in US commodity markets. The behavior and influence of speculators, insofar as they drive coffee future price volatility, forms part of the analysis in Chapter 4.

Although in the past commodity exchanges in the global North saw the highest trading volumes and market size (they still do), commodity futures trading has become increasingly popular in the global South as well. Over the past two decades, commodity exchanges have been erected in Brazil, China, India, Indonesia, Mexico, Hong Kong and South Africa, among others. Coffee contracts traded on the BM&F in Brazil are some of those considered in the subsequent empirical analysis. The FIA notes that developing country exchanges, including for commodities, have been witnessing some of the most explosive growth: “As the global brokers well know, this business is no longer concentrated in the major European and North American centers… Stepping back from the individual exchange level, it is interesting to look at a breakdown of the global volume total by region. The Asia Pacific region accounted for 28% of all futures and options traded on exchanges worldwide in 2007, versus just 22% for Europe… Many of [the developing country] markets are still finding their legs, and the growth of trading, as the exchanges continue to list new contracts, and risk management becomes more common, is likely to be one of the biggest volume drivers for many years to come.
(Burghardt 2008).” According to FIA figures, of the 30 largest derivatives exchanges (by volume), 13 are located in the global South as of 2008.⁴¹

That derivative market growth has been most pronounced over roughly the past three decades is not a matter of chance. The period of rapid derivatives growth (one we appear to still be in the midst of) roughly corresponds to the period in which neoliberal economic globalization, spurred on by economic policy liberalization, has unfolded. Derivatives, as mentioned above, exist and have value only in an environment of volatility. Beginning in the early 1970s in the global North and the 1980s in the global South, governments began to liberalize their economies, dismantling government institutions and policies that had stabilized and insulated national economies and their participants in the face of market shocks and excesses—for example, exchange and interest rate controls, capital controls, tariffs, quotas, and commodity price stabilization programs (and, some of these measures served to prevent certain economic shocks from occurring at all). Indeed, public controls on prices and capital flows, characteristic of the post-Depression global economic order, effectively strangled derivatives trading. In an environment of public price fixing and management (e.g. for commodities or foreign exchange) trading in derivatives amounts to betting on the fate of government policies and institutions, a reality which served to curb derivatives market activity by speculators. Further, such public mechanisms for risk prevention and management (for this is one way of viewing price and capital controls) precluded growth in demand from potential hedgers—if government was managing risk, there was no reason to take on such duties privately.

Indeed, economic liberalization has paved the way for derivatives market growth and expansion. Especially significant for derivatives markets was the 1971 suspension of the dollar’s convertibility to gold in the US and late 1980s-1990s dismantlement of international and national commodity price stabilization mechanisms. Jacob Hacker has described the economic liberalization period in the US (in terms that apply equally well beyond) as one characterized by “risk privatization”—that shift in responsibility for risk management from government onto individuals and families (Hacker 2004; Hacker 2006). With decreasing commitments by government to manage risks on behalf of their constituents, individuals (and firms) have been left to do so privately. As Bryan and Rafferty so eloquently put it: “It’s not that the world is inherently more risky than it has formerly been, but there is probably a greater exposure of individuals to those risks than there has been for some time (2005, 7).” Christopher Gilbert, economist and long-time critic of the ICA, contends precisely this same point in the coffee context. One the one hand, he argues that statistically the ICA did not reduce the volatility of global coffee prices—they were and still are very volatile. On the other hand, “market liberalization, and in particular the abolition or reduction in powers of domestic marketing boards, has resulted in price volatility being passed through much more directly to farmers (2005, 6).” Consistent with Hacker, Bryan and Rafferty, the risks themselves remain much the same. What has changed is the who and the how of risk management. It is no mystery that private risk markets, derivatives markets, have gained in popularity in proportion as governments retreat from their post-Depression role in economic risk management.
Having discussed relevant coffee and derivatives background, the next chapter begins the three part evaluation of the income security potential of futures markets for coffee farmers by examining the cases of Mexico, Brazil and Uganda.
CHAPTER FOUR
Hedging and income security during the coffee crisis:
A best case portrait

“[T]he position of the rural population is that of a man standing permanently up to
the neck in water, so that even a ripple is sufficient to drown him.”
-R.H. Tawney\textsuperscript{42}

“I’d like you to tell people in your place that the drink they are enjoying is now the
cause of all our problems. We grow the crop with our sweat and sell it for nothing.”
-Lawrence Seguya, Ugandan coffee farmer\textsuperscript{43}

Introduction

This chapter begins a three part exploration of the contribution of hedging with
futures contracts to the income security of coffee farmers in Mexico, Brazil and Uganda.

The general question framing this chapter is: What exactly does futures hedging do for
the incomes of coffee farmers? And, what are the implications of the answer for
policymaking? Recall from Chapter 2 that there appears to be some confusion among
researchers about the potential contributions of futures hedging to alleviating farmer
income insecurity. Throughout, I refer to the congruence between the producer income
problem and the gains from hedging in terms of the “quality” of the income security
service that hedging provides.

\textsuperscript{42} Tawney 1966, 77.

\textsuperscript{43} In Gresser and Tickell 2002, 6.
As also discussed in that chapter, this portion of the investigation makes a “best case” for the income security potential of futures markets in the coffee context. Put differently, I endeavor here to be as generous as possible to proponents of futures hedging as an income security arrangement for developing country coffee farmers. I utilize at least four separate methodological mechanisms to construct the best income security case for derivatives (see also Chapter 2’s discussion of research methodology).

First, I measure the gains from hedging during the 1998-2002 coffee crisis, a time during which future coffee prices fell precipitously. This historical setting, and the price trends that prevailed therein, helps to maximize the absolute income gains of short hedgers like coffee farmers who profit from futures hedging in an environment of falling futures prices, as was the case during the coffee crisis.

Second, I employ a host of enabling assumptions that eliminate the variety of obstacles coffee farmers face in reality when they attempt to access futures markets (such as size, cost, yield, knowledge and information obstacles). Recall from Chapter 2 that these assumptions also enable me to investigate the quality of the income security service provided by futures markets independent of the impact of access and other obstacles that pose additional problems for farmers. These assumptions are scrutinized in detail in the next chapter, Chapter 5. Below, I’ve reprinted the “access-related” assumptions from Chapter 2, without explanation, for the reader’s reference. I also make “general” and “calculation simplifying” assumptions, and these are not reprinted here. Chapter 2’s discussion of this chapter’s methodology should be consulted for more detailed discussions of all of these assumptions and their implications for my analysis.
• For Mexico, the farmer’s crop is exactly 37,500 pounds for each crop year. For Brazil, the farmer’s crop is exactly 6,000 kilograms (13,228 pounds) for each crop year. For Uganda, the farmer’s crop is exactly 5,000 kilograms (11,023 pounds) for each crop year.

• The farmer hedges her entire crop.

• There are no transaction costs for the farmer (e.g. brokerage fees, clearing and exchange fees, minimum brokerage account requirements).

• The farmer is able to put up the initial margin and make the necessary margin calls.

• The farmer has full information about the coffee and futures market.

• The farmer has sufficient knowledge of and skills germane to futures trading (regarding strategies, etc.) to devise and execute the trades below.

• The farmer can find a broker that is willing to deal in small (one contract) transaction volumes.

Third, I utilize a narrower conception of income security than the robust, multidimensional version that I endorse in Chapter 2 (the definition I employ there and in later chapters includes stability, certainty, adequacy and (in)equality). As discussed in that chapter, many economists and researchers recommend hedging to farmers because this strategy is thought to bring about income stability, with stability frequently conflated with certainty in the literature. Indeed, many orthodox treatments of futures hedging in the agricultural context suggest that farmers are concerned mainly, if not exclusively, with ensuring the stability of their incomes. In other words, scholars who ultimately recommend futures markets in a policy context consider the producer income problem to
be one-dimensional, or two-dimensional at best. In this chapter I give such scholars the benefit of the doubt and assess the gains from futures hedging using only those criterion that they, themselves, suggest. It may be the case that futures hedging provides precisely those benefits that proponents argue they can, but that these benefits are inadequate to address all four dimensions of the producer income problem.

Utilizing only these stability and certainty criteria the evidence is quite mixed as to the performance of futures hedging. Under certain conditions using particular strategies in specific country contexts, futures hedging can stabilize incomes and make them more certain relative to not hedging at all. In other scenarios, however, futures hedging can actually destabilize farmer incomes relative to not hedging and deliver a false sense of certainty due to the weakening basis.

Fourth and last, towards the end of this chapter I include additional data that suggests that futures hedging can raise the incomes of coffee farmers under certain conditions, making income more adequate to the needs of farmers and their families. While very few scholars argue for futures on this basis, the evidence from the three cases suggests that perhaps they should be.\footnote{Again, Dodd 2007 is a notable exception insofar as he argues, with compelling empirical support, that hedging under certain conditions is highly profitable.}

The chapter proceeds as follows. In the second section, directly below, I discuss the importance of income stability, certainty and adequacy for farmer well-being. In the third section, I outline the calculations performed and present the empirical results. As this third section is quite long, it is broken up into topical subsections in which the
various results are presented and discussed. The fourth section concludes with a few summary remarks and a discussion of implications for policymakers.

**Income stability, income certainty, income adequacy and farmer well-being**

The concepts of income stability, income certainty and income adequacy require elaboration, as do the influence of each on farmer well-being. These concepts and consequences provide the framework for the subsequent data presentation and suggest the welfare consequences of my findings. Throughout I focus upon the welfare implications of income volatility, uncertainty and inadequacy for small farmers, who are often also poor, risk-averse, and lacking alternative sources of income, other assets and access to credit (see Chapter 2 on the particular constellation of traits and characteristics that often accompany ‘smallness’ in a liberalized agricultural setting). The discussion below is a general one, focused upon smallholders in general, while in subsequent chapters I elaborate in more detail on the specific situations of smallholders in the three case countries.

**Income stability and certainty**

Discussions of income stability in agriculture generally focus on two types of stability: intra-seasonal and inter-seasonal. It is exceptionally difficult to talk about stability without also talking about certainty, or the predictability of income streams. While these two concepts are frequently conflated in the literature on hedging (e.g. ITF 2006) it seems worthwhile to untangle them here. Stability refers to the regularity of income flows (i.e. their variance over a given period of time). Certainty relates to expectations of what incomes will be in the future.
In theory, incomes can be stable, but uncertainly so. It might be the case that this year’s income is precisely the same as last year’s, but that I didn’t believe in advance that this would be the case. In theory, incomes can also be certainly unstable. This year’s income might be much lower than last year’s, but I believed in advance that this would be the case. Put differently, income stability refers to the *actual* pattern of income streams over time, while income certainty refers to *beliefs* about patterns of income streams over time. It was presumably the subjective nature of ‘certainty’ that led Kenneth Arrow to remark: “[O]ur knowledge of the way things work, in society or in nature, comes trailing clouds of vagueness. Vast ills have followed a belief in certainty (in Bernstein 1996, 7).” Stability is an empirical matter, while certainty is not necessarily so.

That said, the two concepts are to some extent linked. If my income is relatively stable over the course of several years, I may be relatively certain that this pattern will continue in the future. This is not wholly guaranteed. Rather, past experience of income stability can lead to *expectations* of the same in the future. Conversely, past experience of income instability can lead to feelings of uncertainty about the future. Bernstein remarks extensively on the age-old debate, also discussed in the previous chapter, as to what extent “the past determines the future”: “Which matters more when facing a risk, the facts as we see them or our subjective belief in what lies hidden in the void of time? Is risk management a science or an art (1996, 6)?”

The two concepts are also linked in their similar consequences for farmer well-being, and it is this similarity that results in their being so frequently lumped together. In terms of well-being it is useful to distinguish between the farm enterprise on the one hand and the farmer (and her family) on the other. I make this distinction for explanatory purposes
only. In reality the two are complexly interwoven: the success of the farm enterprise has implications for the material well-being of the family, while the well-being of the family impacts the success of the farming enterprise.45

In general, incomes dictate what we can afford. This is a different type of guidance than that offered by prices. While prices in theory tell us what sorts of activities we should undertake or refrain from to maximize profits and minimize waste and risk (for farmers, prices are ‘guides’ to production and investment), incomes tell us whether or not we can afford to undertake these activities. At the farm and family levels, there are both short and long term decisions to be made relating to investment and consumption.

In the short term (over the course of a single crop season) farmers consider many types of investment in their operation, including: extent and type of input application (e.g. labor, pesticides, fertilizers), extent of pre-harvest financing, extent of routine maintenance (e.g. weeding) and whether and to what extent the crop should be harvested.46 At the family level, short-term consumption decisions may include expenditures on food, clothing, medical expenses, fuel and school enrollment fees. These short-term decisions relate to intra-seasonal income stability.

The flow of coffee income that comes to the farm and family over the course of a single crop season dictates the extent of seasonal farm investments and short-term family consumption, particularly in the absence of alternative income sources, savings, other

45 As one example, farmers often cite illness or health problems as one of the more important risks to their farm.

46 During the coffee crisis farmers in many countries decided not to harvest at all as prices and incomes had fallen so low as to make labor application unremunerative. Coffee cherries rotted on the trees.
assets or access to credit.\textsuperscript{47} When incomes suddenly fall (i.e. become unstable, volatile) investment and consumption also fall (again in the absence of ‘smoothing’ instruments). The ITF (2002) and Bigirwa (2005) note that many Mexican and Ugandan farmers simply stopped applying fertilizer to their coffee trees when incomes started to fall during the recent coffee crisis. For the family, a sudden fall in income can result in restricted consumption. Holzmann and Jorgenson note that, “The absence of efficient market-based or government provided consumption-smoothing instruments often results in the use of costly informal coping mechanisms once the adverse income shock hits, such as pulling children out of school, reducing nutritional intake, selling productive assets, or neglecting human capital accumulation (2000, 7).” Sayer relates the situation of many Ugandan coffee farmers during the recent crisis who struggled “to buy essentials like sugar, soap, salt, kerosene, tools and clothes … Secondary school enrollment has declined as tens of thousands of children are sent home for lack of fees (Sayer 2002, 10).” Such income shocks can also undermine the ability to repay debts.

Similarly, the flow of income from year to year (inter-seasonal stability) dictates those longer-term investments that a farmer and her family can afford. At the farm-level, deciding to invest in new production and/or processing technologies, the production of different crops, developing new farming skills, acquiring new land and planting new coffee trees (which take several years to mature) are important considerations. At the family-level, a longer term investment in education or shelter might rely upon inter-

\textsuperscript{47}This is actually a rather reasonable assumption in the context of small coffee farmers. Access to credit is a persistent problem, and many smallholders rely on coffee for all cash income. Of course, this is not the case for all coffee farmers (degrees of asset- and income- poverty differ), but it seems to describe more aptly reality than assuming the opposite. See Charveriat 2001, Gresser and Tickell 2002, Daniels and Petchers 2005, Wild 2004, Sayer 2002, and Gibbs et al. 2008.
seasonal income flows as such items are paid for over the course of many years. Longer-term investments may similarly be jeopardized by intra-seasonal instability. If incomes become unstable, from one year to the next, such investments can suddenly become unaffordable—new trees might not be maintained and educational investments might be suspended.

Related to but different from the matter of instability is the matter of income certainty. Interestingly, uncertainty about future income streams has much the same effect as the income shocks themselves, particularly for risk-averse farmers who lack alternative income sources, significant savings, other assets or ready access to credit. Income uncertainty, over both the short and long term, can result in “capital rationing” at both the farm and family level. Capital rationing involves making decisions that result in lower, but more stable incomes, and it is often undertaken by poor individuals and families that are exposed to relatively frequent shocks.  

Morduch explains: “Fear of risk can lead poor households to forgo potentially valuable new technologies and profitable production choices (1999, 187).” UNCTAD agrees: “Uncertainty about future incomes makes it difficult for farmers to make commitments with respect to future payment obligations (e.g. debt repayment, investments in land, machines, equipment and school fees for children) (2002, 6).” Capital rationing involves a trade-off between lower, certain and more stable short-term incomes on the one hand, and potentially higher but more uncertain incomes in the long-

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48 The poor are not a homogeneous group. In some cases, poor farmers are not so risk averse and are not willing to forego higher incomes in order to stabilize them. UNCTAD (2002) states that while high levels of risk aversion are common across poor farmers, this is not the case for all poor farmers. This is a general tendency, not a uniform trend.
term on the other. The World Bank puts it as follows: “[T]he poor are forced to make production decisions using the objective of minimizing risk, rather than maximizing profits, and thus they must forego more remunerative activities that could provide means of escape from their poverty (2005, 2—managing ag risk piece).”

This evidence collectively implies that income instability and income uncertainty do not impact all individuals uniformly. Among other factors, farmers with alternative income sources, savings, sufficient productive assets (especially land and livestock) and access to credit are not negatively impacted to the same extent as are lower-income, undiversified and asset-poor farmers with bad or no credit. This is why, UNCTAD notes, “Smaller, poorer farmers are more risk-averse than larger, richer ones (2002, 6).” The greater welfare costs of instability and uncertainty for the poor resulted in the World Bank citing “vulnerability to risk” as one of the four dimensions of poverty in the 2000/1 World Development Report.

Income adequacy

The coffee crisis literature highlights those expenditures for which money income is required by coffee farmers (information obtained via interviews), including production costs (especially labor), food, medical expenses, school fees, fuel and debt repayment (see, e.g., Gresser and Tickell 2002, Charveriat 2001; Eakin 2006; Sayer 2002; Watson and Anchinelli 2008). While many small Mexican and Ugandan farmers farm diversified plots that combine subsistence production of food crops with coffee production for export, there are necessary items that must be purchased in cash. For example, sugar and salt require cash in Uganda, as does kerosene for fuel (Sayer 2002, 10).
More generally, Sen explains the complex links between income levels and well-being: “This is not to deny that deprivation of individual capabilities can have close links with the lowness of income, which connects in both directions: (1) low income can be a major reason for illiteracy and ill health as well as hunger and undernourishment, and (2) conversely, better education and health help in the earning of higher incomes (1999, 19).” The effects of higher incomes on well-being thus include direct links to health-related, educational, nutritional and other achievements, and indirect links to greater future earning power. Income inadequacy threatens deprivation, inability to achieve desired functionings, farm failure and in some cases loss of land and life.

To sum up, this section has illustrated the importance of intra-seasonal and inter-seasonal income stability, income certainty and income inadequacy for the material well-being of farmers in general and small farmers in particular. Evidence from a variety of sources suggests that the impact of instability and uncertainty is unevenly distributed, with small, poor farmers being most negatively impacted thereby. Further, for small farmers income inadequacy threatens achievement of the most basic functionings and fulfillment of the most basic needs. This is a crucial consideration in the next chapter. The reader may also want to note the rather general nature of the discussion above. The next chapter, Chapter 5, discusses in more detail the actual income experiences of small coffee farmers in the three case countries during the coffee crisis. The next section proceeds to discuss a variety of hedging strategies and evaluates how they perform in terms of stability and certainty.
Hedging during the coffee crisis, 1998-2002: Mexico, Brazil and Uganda

In the analysis below, I estimate the income stability, certainty and adequacy gains from hedging during the coffee crisis for a hypothetical farmer the characteristics of which appear above as assumptions. While the farmers discussed below are fictitious, they do retain some of the characteristics of their real-life counterparts—for example, in terms of growing seasons and type of coffee produced, the derivatives exchanges on which they (would) trade, and the prices at which they sell their crops in the cash market each year.

I developed 6 distinct hedging strategies of two different types to evaluate the performance of futures markets in addition to the default strategy of not hedging at all. In this manner I try to account for the fact that farmers may choose different hedging strategies, and that the income effects of hedging may vary accordingly. Even at the outset this suggests that the gains from hedging are not fixed and are determined to some degree by individual preferences (e.g. risk aversion) and expectations about the future, among other factors that shape a farmer’s choices.

The first is an “plain annual” hedge in which each season’s crop is hedged separately by selling only one futures contract per season. The plain annual hedge is repeated every season for the duration of the coffee crisis. For example, the Mexican farmer hedges his 1998/99 crop by selling one March 1999 futures contract in April 1998. The process is repeated each successive year, i.e. in April 1999, one March 2000 contract is sold. In this manner a succession of annual hedges extends throughout the crisis. At times I refer to
the annual hedge as a ‘plain’ hedge as it is the least complicated of the hedging strategies employed.

The other five strategies are “rollover hedges”. These five strategies are not the only ones that could have been employed, of course, but rather represent a sample of strategic options with variations in duration and starting date. For each farmer in each country, the “annual rollover” is a one crop season rollover hedge that is performed for each of the four years of the crisis; Rollover #1 is a two crop season hedge that begins at the onset of the crisis; Rollover #2 is a four crop season hedge that also begins at the onset of the crisis; Rollover #3 is a one crop season hedge that begins near the mid-point of the crisis; and, Rollover #4 is a one crop season hedge that begins toward the end of the crisis. Additional detailed discussions of the strategies can be found in Chapter 2’s discussion of method.

A rollover hedge involves the simultaneous purchase and sale of a futures contract and is thought superior to a plain hedge for two reasons. First, liquid coffee futures markets do not extend far enough into the future for the farmer to lock in a price more than 12 months in advance (an incomplete market problem much lamented by certain economists; see McKinnon 1967 and Newberry and Stiglitz 1981). A rollover hedge enables the farmer to continue the hedge beyond the time horizon accommodated in the

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49 The timing of the crisis is different in each country case. The “onset” was chosen by determining that month and year in which cash market prices began to decline well below the level experienced during the same time the prior year. The assumption here is that farmers may not have reasonably begun to hedge right when prices began to fall, particularly because price levels were still fairly high by historical standards. In Mexico and Brazil, the “onset” was determined to be in the first half of 1998; in Uganda, the “onset” was not until the first half of 1999.

50 Contracts exist that do extend further, but these markets tend to be very illiquid and thus unsuitable for most hedgers.
market by “rolling over” a contract that is about to expire into a contract with a later expiration date.

Crucially, in the first year of the rollover, a farmer must sell the number of contracts equivalent to her production over the entire duration of the hedge. For example, in the first year of a four year rollover hedge, a farmer must sell enough contracts to cover four years’ production volume. In the second year, a farmer must sell enough contracts to cover three years’ production volume. And so on. The idea is to accumulate hedging gains that, in aggregate over the duration of the hedge, allow the farmer to reap a relative stable and high effective price of coffee. In other words, when tallied up and spread out over the years of the rollover, the gains from the hedge should be adequate to smooth prices and incomes when viewed in hindsight. A rollover should in theory allow farmers to “lock in” a high current price for several years into the future, although the gains from the hedge are not distributed evenly over the days, weeks, months and years during which the hedge is ongoing. The mechanics of rollovers are important to considerations of income stability, and will be returned to later on.

Second, rollover hedging is frequently employed by traders who are looking to hedge only for a short time. The technique allows traders to buy and sell futures at times when markets are most liquid. Higher liquidity (i.e. higher trading volumes) allows the trader to take advantage of better prices as well as ensuring that volume is sufficient to make offsetting trades if necessary. Thus, even though a one-crop season hedge could be achieved without a farmer rolling her position over (like the plain annual hedge), it still might make sense to utilize this technique in order to take advantage of these liquidity benefits. In other words, the market for the more distant contract required for the plain
annual is less liquid than the markets for the nearby and second nearby contracts required
for the rollover, making the rollover look more attractive.

Below, I present the results of my calculations, which are subdivided into topical
categories, and discuss the implications for coffee farmer income stability, certainty and
adequacy.

One general comment before moving on to data specifics: please note how *similar*
the results are in each of the country cases. While some contamination of the data across
countries is to be expected (as the results are gleaned from utilizing very similar hedging
strategies in each case), the degree of similarity is nonetheless surprising.

The data suggest that despite being on three continents, growing two different types
of coffee, receiving different farmgate prices, and trading on three different derivatives
exchanges, a hypothetical farmer from each of the three countries will witness very
similar *patterns* in regard to the income stability and certainty gains from hedging. This
perhaps speaks to the similarity in price *trends*, both cash and future, across coffee future
and spot markets that are globally geographically dispersed. This is a rather astounding
conclusion that could be explained with reference to a variety of factors, including: the
ease with which information is transmitted in an era of globalization; the homogeneity of
available market information as a consequence of the Internet and like technologies; the
presence of the same kinds of actors who can be found trading in various markets
utilizing similar trading strategies and engaging in herding behaviors (e.g. institutional
investors like hedge funds and commodity index funds); the increasing fungibility of
distinct coffee varietals by coffee consumers since the collapse of the ICA; and so on.
However, further exploration of such factors is outside the scope of this inquiry.
That said, even on the surface this finding has implications for coffee policy. Although serious diversity exists across countries in terms of access and alternatives (discussed in later chapters), in many respects the income security service provided by futures hedging is comparable across different countries and derivatives exchanges. In other words, the degree to which futures hedging addresses the producer income problem is to some extent independent of producer location and the derivatives exchange on which hedging is undertaken. This suggests that coffee farmers and policymakers might realistically expect to derive, irrespective of location and all else equal, an income security service from futures hedging that is surprisingly homogeneous.

These results are especially interesting given that there is good reason to expect otherwise. Given the existence of its own domestic coffee futures exchange, it seems likely that future prices for the Brazilian farmer trading at home would move very differently than did future prices for the Mexican and Ugandan farmers trading in New York and London. Depending on one’s view of the relationship between future price volatility and speculative activity, it seems reasonable to expect that future prices in Brazil would either be substantially more or substantially less volatile than the prices on the other exchanges. While somewhat more volatile, the price trends on the Brazilian exchange were not so different so as to mitigate the observable similarities across countries in terms of the income effects of futures hedging.

Further, one would also expect that prices for Robusta coffee traded in London would move differently than the prices of Arabica traded in New York. For the better part of the 20th century, these two species of coffee were seen as distinct, commanded different prices on world markets and appealed to different kinds of consumers. Given
the recent rise in popularity of specialty coffees, often high quality Arabicas (see Chapter 6), one would also expect to see a divergence in conditions in each of these markets, differences that would lead the futures markets to behave differently. While some price trend differences are observable across the New York and London markets and thus also across the Mexican and Ugandan cases, these differences were again not so different so as to mitigate the real similarities across countries in terms of the income effects of futures hedging.

**Intra-seasonal income stability and certainty**

Two different considerations bear upon the matter of intra-seasonal income stability: the time-pattern of income from coffee sales throughout the season *and* the time-pattern of income from hedging throughout the season. As for certainty, two different considerations are crucial: the time into the future for which prices, and thus incomes, are fixed via the hedge *and* the movement of the ‘basis’. These issues will be each be addressed in turn.

**Intra-seasonal income stability**

The tables below depicts several sets of figures all aimed at illustrating the monthly pattern of real income\(^{51}\) from coffee sales and hedging over the course of a single crop season (which is timed differently in each country: April 1998-March 1999 in Mexico; October 1998-September 1999 in Brazil; March 1999-February 2000 in Uganda). I calculated the figures for the first crop season under consideration in each case. This

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\(^{51}\) The figures are portrayed in real terms, but I have made the adjustments in such a way as to eliminate the impact of exchange rate and inflation risks on the month-to-month income flows. That is, I utilized the same average CPI and average exchange rates (both from the IMF) to change each amount from coffee crisis-era dollars into 2007 local currencies. This was done in order to ascertain income variability caused by the hedging mechanism itself, independent of exchange rate and inflation induced variability.
decision was an arbitrary one in that calculations for any of the crop seasons under consideration would have illustrated similar possibilities. For each country case the table shows several different calculations: the monthly distribution of real income from coffee sales only; the monthly distribution of real hedging income only for each of the plain annual, annual rollover, rollover #1 and rollover #2 strategies (rollovers #3 and #4 start later on in the crisis and thus provide no income from hedging for this first crop season); and, last the monthly distribution of real total income from both coffee sales and hedging for each of the relevant hedging strategies.

The data below reflect a relaxation of one of the assumptions made at the outset. Instead of farmers withdrawing proceeds from their margin accounts once per year at the end of the crop season, I instead assume that the farmer withdraws the balance towards the end of one month/beginning of the next month (e.g. sometime between March 30th and April 5th). This enables me to illustrate the impact of margin calls and the practice of marking-to-market on intra-seasonal income stability. As noted above, the manner in which farmers withdraw from their margin accounts impacts the time-pattern of cash receipts. In reality, monthly withdrawals are only one of infinite options a farmer and her family theoretically have—farmers might withdraw regularly or irregularly, with corresponding, different impacts on the time-pattern of cash receipts.

In the tables below, the figures in both red color and parentheses are negative income streams.
FIGURE 4.1: Mexico: monthly distribution of income from coffee and hedging, 1998-99 crop season (in 2007 Mexican pesos)

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<td>33248.19</td>
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<td>122567.48</td>
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Figures based on author’s calculations. Data sources: Future price data from NYBOT/ICE; coffee prices paid to growers from the ICO.
FIGURE 4.2: Brazil: monthly distribution of income from coffee and hedging, 1998-99 crop season (in 2007 Brazilian reals)

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Figures based on author’s calculations. Data sources: Future price data from the BM&F; coffee prices paid to growers from the ICO.
FIGURE 4.3 Uganda: monthly distribution of income from coffee and hedging, 1999-00 crop season  
(in 2007 Ugandan shillings)

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<th>Dec-99</th>
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Figures based on author’s calculations. Data sources: Future price data from LIFEE/Euronext; coffee prices paid to growers from the ICO.
Before discussing the implications of this data one term requires elaboration. The farthest right-hand column in each table is labeled “CoV” for “coefficient of variation”.  

A number of important observations can be made on the basis of the data above. First, in each of the three case countries the distribution of income from coffee sales over the course of the season is uneven, with income coming in periodically over the course of the harvest season. The harvest season in Mexico runs from October through March. In Brazil, harvesting is ongoing roughly from June until September. And in Uganda the harvest occurs between October and February (setting aside the small fly crop harvested in August). This is a consequence of the assumption that there is no possibility of storage. The assumption is reasonable considering that many farmers do indeed market their crops as soon as the cherries are harvested and dried with storage either unaffordable or unavailable, or both. Keep in mind that possibility of storage would impact the distribution of income from coffee sales over the course of the year, but not the income earned from the hedge. The data above clearly show the ‘clustered’ nature of income from coffee sales, with all income received during the harvest months.

Second, looking at the rows that indicate the monthly distribution of income from hedging only, it is clear that the income flows are exceptionally variable. In the Mexican case the coefficient of variation for hedging income ranges from roughly 335% to 375%.

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52 A coefficient of variation is defined as the standard deviation of a sample divided by the sample mean, multiplied by 100 (so it may be expressed as a percent). It measures the dispersion of observations from the mean (the standard deviation) relative to the mean itself. A high coefficient of variation reflects a wide (very variable) distribution, while a low coefficient reflects relative regularity in the sample. I use this formulation here so that the variability of the income streams may be compared across cases and across hedging strategies (comparisons not possible using standard deviation figures because of large differences in the mean across strategies and cases).
across the four hedging strategies in question. This means that the standard deviation is 3.35 to 3.75 times the size of the farmer’s average monthly income, i.e. the magnitude of most fluctuations is several times the size of average monthly income. In the Brazilian case, a similar observation can be made, with the coefficient of variation across the four hedging strategies ranging from 350% to 380% for hedging income only. For Uganda these same income flows are somewhat less variable, with the coefficients of variation for hedging income only ranging from 165% to 304% across the four hedging strategies.

The huge variation in income from hedging from month to month is a function of the volatility of future prices on each exchange. Future price volatility means that one month’s huge gains are succeeded by huge losses the following month as farmers have to make margin calls to replenish their dwindling margin accounts.

The Mexican farmer saw serious hedging losses in 4 of the 12 months with the plain annual hedge, and in one month (July) saw a net loss with no coffee income to cover the margin calls. For both Rollovers #1 and #2 and the annual rollover, a full half of the crop season was plagued by hedging-related losses. Further, 4 of these 6 months for Rollover #1, and 5 of these 6 months for Rollover #2 saw a net income loss, as income from coffee was insufficient to cover margin calls. For the annual rollover, coffee income was sufficient to cover margin calls in 3 of the 6 months of negative hedging income.

In Brazil, the plain annual hedging strategy resulted in 4 of 12 months of hedging losses, all of which resulted in net income losses—as in the Mexican case, margin calls were often required during months when there was no income coming in from coffee. This not only speaks to the necessity of farm- and family-level budgeting, but also suggests that the timing of hedging losses may be mismatched with timing of coffee
sales. As was also the case in Mexico, the three Brazilian rollovers also resulted in net income losses—for both #1, #2, and the annual rollover, 5 of the 12 months were plagued by margin calls that could not be covered with coffee income.

In Uganda the plain annual hedging strategy performed much better than those of the other two cases. The income from the annual hedge was negative in only 2 of 12 months, and in both of those months there was sufficient coffee income to cover the margin calls. This suggests that hedging losses in Uganda were better timed to the harvest. The lower frequency with which margin calls had to be made further suggests that prices on the London market moved somewhat differently than those in NY and Sao Paulo. While still volatile, the London prices did not reverse themselves (moving up, then down, then up again) to the same extent as prices on the other two exchanges, resulting in more consistent income gains from the hedge. For the same reasons, losses from the Ugandan rollovers were also less frequent than those in Mexico and Brazil. Rollover #1 saw only 2 months of net income losses; Rollover #2 and the annual rollover both saw 3 months of net income losses. Yet, it remains that such losses, while less frequent than in Mexico and Brazil, still occurred rather often.

Third, in each case the annual hedge produced a more stable income flow than either of the three rollovers. While the annual hedge was undertaken using only one contract, each of the rollovers involved the use of 5 different futures contract with different maturity dates (i.e. delivery months). That the latter produced income flows more variable than the former is suggestive of differences in price trends across contracts with different maturation dates. As will be noted in subsequent sections, the nature of rollover hedging itself partially explains these results for the multi-year rollovers.
It should also be noted that the annual rollover, often employed as an inter-seasonal stabilizing strategy in the futures literature (e.g. Dodd 2007), did not serve to stabilize incomes to any great degree. This crucially suggests the importance of empirical tests of the capabilities of different sorts of strategies under different price conditions. Indeed, under the conditions of this study the rollover annual does not perform the task for which it is usually given credit.

Fourth, only in Uganda did the plain annual hedge really outperform not hedging at all in stability terms. In Mexico, the variability of total income from the plain annual and annual rollover hedges and coffee sales was only marginally lower than the variability of income from just coffee sales. In both Uganda and Mexico, not hedging at all was a better bet (by a large margin) than either of the multi-year rollover strategies. In Brazil, hedging of all sorts actually made incomes more variable, suggesting that cash prices during the Brazilian harvest are at times less variable than future prices.

Fifth, and last, it remains that the income streams produced for the season in question via the four hedges and not hedging at all are all relatively unstable. Even the most stable income flows in the tables above involve month-to-month fluctuations almost equal to the farmer’s average monthly income (see the ‘annual total’ income stream for Mexico and Uganda). Overall, one might thus consider each of the scenarios I lay out to be suboptimal.

**Income certainty**

To reiterate, income certainty refers to the belief that incomes will conform to a specific pattern and be of a specific magnitude in the future. One can be certain, in theory, of both the stability or instability of future income streams. Proponents of futures
for farmers, like the ITF cited in various places in Chapter 2, suggest that hedging with futures can give producers certainty about their future income. Two considerations are important in this context: the time into the future for which these hedging strategies can fix prices and thus incomes and basis risk.

Hedging allows producers to fix prices and thus incomes in advance of actual coffee sales. It is this attribute of futures hedging that arguably gives farmers some certainty about future income, thereby allowing them to make decisions about investment and consumption without worrying if they will be able to afford them. However, futures markets do not extend very far into the future, limiting the extent to which certainty is provided. For the annual hedges, certainty is doled out in roughly one-year increments. The Mexican farmer who sells his 1998-99 crop forward in April 1998 is certain of the price he will get for his crop up until the contract expires in March 1999. With yields held constant, he thus has one year’s worth of income certainty. The same is true in Brazil and Uganda.

For the rollover hedges, however, the situation is different. In these cases the time into the future for which prices and incomes are certain is potentially much longer. Recall that rollover hedging involves the simultaneous purchase and sale of a futures contract such that a hedge can be extended indefinitely into the future. Rollover hedging is thought by some economists to be a good substitute for missing distant futures markets that extend several years forward. Much as annual hedging can “lock in” current crop prices for the duration of the crop season, rollovers are thought to enable traders to “lock in” current crop prices for several years into the future.
For example, Gardner (1989) argues that: “With respect to the ability to lock in a price for a given n-year period, rollovers have more promise” (317). The author finds that for corn, soybeans and cotton during the 1970s-80s, sequential rollover hedging was effective in locking in high crop prices for 3-6 years forward. Yet, Gardner’s results have been recently challenged by Lence and Hayenga (2001) who calculate the gains from sequential rollovers in the corn market for a 100+ year period. They ultimately conclude that: “it is theoretically infeasible for multiyear rollover HTAs [hedge-to-arrive contracts], and for rollover hedges in general, to succeed at locking in high current prices for crops to be harvested one or more years into the future” (Lence and Hayenga 2001, 117). There is thus serious debate as to whether rollover hedging can provide price and income certainty several years into the future, substituting for missing distant futures markets.

The ability of both annual and rollover hedges to provide certainty about farmer incomes is potentially mitigated by at least one important factor. The prices and incomes fixed (i.e. locked in) at the time a future is sold may not be the price and income that a farmer actually receives when her position is closed out or rolled over. This is due to the existence of basis risk. The ‘basis’ is defined as the cash price less the future price at a given point in time. The basis exists due to price and quality differences across markets in different locations among other factors. In the case of coffee farmers, prices paid to growers in local markets tend to be less than prices established on futures exchanges (i.e. the basis is negative), as transportation costs, quality differences, and other factors drive a wedge between local cash prices and futures prices.
It is not the existence of a basis *per se* that is a source of risk for hedgers. However, the existence of a basis does indicate that the futures contract/market in question is not perfectly matched to the product a given producer is growing and selling. This suggests that the basis may not remain constant if there are factors or occurrences that impact prices in one market but not in the other.

Indeed, it is *changes* in the basis over time that are a source of risk for hedgers.\(^5^3\) If the basis weakens (becomes more negative), a short hedger’s gains in the futures markets will *not* cover her losses in the cash market, all else equal. If the basis strengthens (becomes less negative, or even positive), a short hedger’s gains in the futures market will *more than* cover her losses in the cash market, all else equal. When one hedges she is in effect trading one risk for another—the risk that cash prices will fall is exchanged for the risk that future prices and cash prices may not fall in tandem. One commentator recently described basis risk as “the risk that the insurance coverage does not exactly match actual losses” (Groome et. al. 2006, 17). In other words, one can only be certain that the price/income fixed when the contract is entered into will be the price/income actually received if the basis stays constant over the duration of the hedge (i.e. if future and cash prices move exactly together). Was this the case for the crop season under consideration here in the three case countries?

The impact of basis risk on income certainty is most clearly seen with the plain annual hedges in the three country cases. To reiterate, what these basis calculations show

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53 Causes of changes in the basis are debated. Exchange rate changes, for which I control in my calculations, are frequent culprits. That said, changes in local transportation costs that the futures market does not take into account may also be implicated. As another example, a rapid change in the quality of a given producers crop over the period that a hedge is in place (maybe due to leaf rust or some other disease) can increase the wedge between the future and cash price.
is the difference, if any, between what a farmer would have reasonably expected to earn based on the local price prevailing at the time the hedge was entered into (i.e. the price that farmers intend to “lock in” by hedging) and what the farmer actually did earn based on the effective price achieved with the hedge in place.

The reader should keep in mind that there are actually two effects at work here due to the storage-related assumption that I made earlier—the impact of the hedge on the effective price received and the impact of price averaging over the course of the harvest on the effective price received. In virtually every case (i.e. country and strategy) these effects are mutually reinforcing. By this I mean that the hedge did better than expected in and of itself, and that price averaging also raised the farmer’s effective price relative to the expected price. Put differently, in almost every case below, the effective price was actually much larger than the expected price due to both the strengthening of the basis and the positive effects of price averaging. The case of the Ugandan plain annual below is an important exception—in this particular case the basis actually weakened over the course of the hedge but the effect of price averaging was so favorable as to make the effective price higher than the expected price despite the weakening of the basis.

For simplicity, I assume that the farmer sells her entire crop in the last month that the hedge was in place when I make these basis calculations. In other words, the spot prices used for the calculations are not the harvest season average prices that I use in the income stability and adequacy calculations. This has the effect of separating the certainty effects of the hedge itself from the extra income benefits of price averaging over the course of the harvest season (as opposed to selling coffee all at once at the end of the harvest when
prices tend to be relatively low). Only in the Ugandan case below does price averaging reverse the negative income impact of the weakening of the basis.

For the plain annual hedges in both Mexico and Brazil the basis strengthened from the time the contract was sold to the time the hedge was closed. In Mexico the basis became less negative (strengthened), moving from roughly -17 US cents/lb in April 1998 to -10 US cents/lb in February 1999. The Mexican farmer would have reasonably expected to earn US$1.07/pound at the time the hedge was entered into (this is the cash market price paid to Mexican growers at the time the hedge was begun), but actually earned US$1.14/pound (again, with the storage assumption suspended; if price averaging effects are taken into account the Mexican farmer actually received a higher effective price per pound). This latter figure is the “effective price” of coffee with the hedge in place and is larger than the expected price by the amount of the change in the basis (+7 US cents).

In Brazil the basis strengthened as well, moving from roughly -16 US cents/lb in November 1998 to -1 US cents/lb in September 1999. The Brazilian farmer would have reasonably expected to make US$0.79/pound, for this was the price prevailing for Brazilian growers at the time the hedge was begun. The effective price that the farmer received, however, was actually US$0.94 per pound. The effective price is larger than the expected price by the amount of the change in the basis (+15 US cents). As in the Mexican case, price averaging only served to make the effective price higher, reinforcing the strengthening of the basis.

In both of the Mexican and Brazilian cases the income expected by farmers was less than the income actually received. In terms of income adequacy this is undoubtedly a
good thing as a farmer earned more income than he expected at the outset. Not only was
the local price prevailing at the time the hedge was begun a good indication of the income
that farmers could expect to receive from coffee sales and hedging, but it actually turned
out to be a conservative estimate because the basis strengthened over the course of the
hedge.\footnote{One could argue that making more money than expected is problematic from a budgeting perspective. This perhaps represents meals that could have been eaten, school fees that could have been paid or laborers who could have been hired. On the basis of the prices fixed in the contracts, the given coffee farmer in each country would have under-budgeted expenditures on family and farm needs. This may be problematic especially for small, poor farmers who, for example, may be even more undernourished than their incomes required them to be. Yet, I am loathe to make this argument in the main text, even though it may have some theoretical appeal. This is because I have never personally been upset when I earned more money that I thought I was going to. I have always viewed such personal financial occurrences, rare as they have been, as positive developments.}

Keep in mind, however, that the price prevailing at the beginning of the hedge
and the mechanics of the hedge itself give no indication of \textit{when} over the course of the
hedge the farmer can expect to receive this income. The prevailing local market price
only indicates the price (and thus income) that can be expected by the time the hedge is
closed out.

By contrast, in the Ugandan case the basis weakened over the time the plain annual
hedge was in place, moving from roughly -12 US cents/lb in June 1999 to -16 US
cents/lb in February 2000. The Ugandan farmer’s income was thus less than would have
been expected at the time the hedge was entered into. However, as noted above, the
effect of price averaging was such that the farmer actually received more than expected in
this case as well. Taking into account price averaging, the Ugandan farmer would have
reasonably expected to earn US$0.57 per pound (this was the local cash price prevailing
at the time). If the farmer sold his crop all at once at the end of the crop season, the
effective price received is only $0.53 per pound due to the effect of the weakening basis
(-4 US cents). Price averaging (where equal proportions of the crop are sold during each month of the harvest—see above) lifts the effective price received to US$0.74 per pound.

The Ugandan farmer, like his hypothetical Mexican and Brazilian counterparts, thus received more than might have reasonably been expected at the beginning of the hedge. Yet it should be noted that the Ugandan case nonetheless illustrates the impact of a weakening basis on income certainty—indeed, the weakening of the basis means that farmers expect more income than they actually receive. While this did not occur often in the setting and cases that I have selected, it is an important qualifier with rather serious implications for the well being of the farmer. In the absence of credit, savings, alternative sources of income or other assets, this mismatch (between the insurance coverage and the losses actually sustained) might translate into lower nutritional intake or difficulties paying medical expenses among other consequences. Under other price conditions and in other country settings the weakening of the basis may well be a more significant concern from the perspective of income certainty.

The findings above as to the movement of the basis in the first year of the plain annual are replicated almost identically in the first year of the annual rollover in each country case. As is the case above, when the beneficial income effects of price averaging are controlled for, the basis strengthened over the first year of the rollover annual in both Mexico and Brazil. In Mexico, the basis strengthened by 6 US cents between March 1998 and March 1999. In Brazil, the basis strengthened by 4 US cents between September 1998 and September 1999. Again, this implies that this strategy resulted in a higher effective price per pound of coffee than would have been expected at the beginning of the hedge.
As was also the case above, the basis in Uganda weakened slightly over the course of the first year of the rollover annual. Between June 1999 and February 2000 the basis weakened by one US cent, after controlling for the effects of price averaging. With price averaging, the expected price was less than the effective price, just as was found above for the first year of the plain annual in Uganda.

Moving onto rollover hedges #1-4, my calculations suggest that rollover hedging during the coffee crisis in the three case countries would indeed have succeeded in locking in current prices. What’s more, as was the case with the Mexican and Brazilian plain annual hedges, the basis strengthened over the course of each of these four rollover strategies in each country case, meaning that the effective price with the hedge was consistently larger than the expected price at the time the hedge was begun. As was also the case above, taking into account the effects of price averaging only further raised the effective price over the expected price. The table below shows the expected and effective prices for each rollover in each country case. Again, I have suspended the price averaging assumption, making the calculations as if each farmer sold her crop in the cash market during the last month of the harvest.

**Figure 4.4: Expected and effective prices for Rollovers #1-4 in Mexico, Brazil and Uganda**

<table>
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<th>Brazil</th>
<th>Uganda</th>
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<tbody>
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<td>Effective price (USD)</td>
<td>Expected price (USD)</td>
</tr>
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<td>1.26</td>
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<td>Rollover #2</td>
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<td>Rollover #3</td>
<td>0.79</td>
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<tr>
<td>Rollover #4</td>
<td>0.59</td>
<td>0.91</td>
<td>0.26</td>
</tr>
</tbody>
</table>
The table above illustrates that the basis strengthened over the course of each of Rollovers #1-4 in each country case. This means that farmers expected based on the local cash price prevailing at the time the hedge was begun less than they actually received by the time the hedge was closed out. In some cases the basis strengthened substantially. For example, Rollover #2 in Mexico saw the basis strengthen by a full 54 US cents. In others the basis strengthened only marginally. For example, Rollover #3 in Brazil saw the basis strengthen by only 3 US cents. This suggests that farmers in each country would have been pleasantly surprised had they based their spending decisions over the course of each hedge on the expected price—each farmer got an additional income ‘bonus’ due to the movement of the basis.

Dodd’s (2007) calculations in the coffee market for the years 1999-2004 resulted in a similar conclusion. I reprint his comments here at length, as the author’s discussion of his results are very helpful in explaining the profitability of rollover strategies under market conditions like those that prevailed during the coffee crisis:

During this period, any sale of coffee in the front futures contract and rolled over into any period in the future, will prove an effective hedge and will even generate extra profits in the process because of the persistence of the positive relationship between buying back the futures at a lower price than the selling price of the next futures contract.

Although this relationship will not always prevail, the above examples show that it is often the case for these commodities [e.g. cotton, cocoa, coffee]. The economic point is that when market exhibit this characteristic, if not persistently at least for most times, then they can be used effectively – and often profitably – to hedge commodity price risk (Dodd 2007, 24).

The basis ‘bonus’ is thus a consequence of the particular future and cash market conditions prevailing during this period. As I did above, Dodd is also careful to point out
that these conditions will not always prevail and that at other times rollover strategies may not have this beneficial effect.

Further, it is important to keep in mind that the effective price achieved with the hedge is only known in hindsight, when the hedge has been unwound (i.e. closed out). The size of the bonus is thus unknown at the time the contract is entered into and is uncertain for the duration of the hedge, suggesting that the basis bonus should not necessarily be incorporated into farm and family financial planning.

While the hypothetical farmer in each country case could have been relatively certain of a minimum income over the time period that the hedge was in place (remember that yields are assumed to be constant here), there is little certainty, if any, about when within this period the income will be received nor about how much will be received at different points throughout. Of course, as the hedge progresses traders could get a sense of the income to come based upon the assumption that the effective price will be at or above the expected prices combined with the gains that have accrued up until that point. Yet such calculations are inherently risky given that market conditions can change quickly and a strengthening basis is not a given.

Further still, rollover hedging does not deliver stable income streams. As seen above in the section on intra-seasonal income stability, and as will also be shown below in the inter-seasonal context, actual receipts from the rollovers are generally quite variable. I ask the reader to keep this point in mind as I continue on to discuss inter-seasonal income stability and hedging in the three case countries.
Overall, then, the evidence suggests that the annual hedges did a reasonable job predicting incomes in the short-run (i.e. over the course of a crop season). In both Mexico and Brazil, effective prices were higher than expected prices, and in Uganda price averaging negated the deleterious effect of the weakening basis. By contrast, the rollover hedges seem better at predicting incomes over a longer time period (1-4 crop seasons), but fall short in predicting short-term income streams. In all three country cases and for all four rollover strategies in each case, the expected price was indeed a reasonable assurance of a minimum level of income over the course of the hedging period.

**Inter-seasonal income stability**

Evaluating inter-seasonal income stability requires an analysis of the time-pattern of income from coffee sales and hedging across the several years of the coffee crisis. I do not address the issue of certainty as I did in the previous section—for the certainty delivered via hedging remains the same in the inter-seasonal context as it did above. An annual hedge, irrespective of how many successive years production are hedged, can only fix prices one year in advance. The rollover hedge performs in certainty terms in the manner outlined in the previous section of this chapter.
Below appear three graphs, one for each country case. Each graph illustrates real annual income from hedging and coffee sales by hedging strategy employed during the coffee crisis. A discussion and explanation of results follows the data presentation.

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55 Again, I have adjusted to current local currencies in such a way as to eliminate the impact of exchange rate and inflation changes on year-to-year income flows within the same strategy. I.e. I utilized the same average CPI and average exchange rates (both from the IMF) to make all conversions within the same strategy. Across strategies there may be marginal variations due to exchange rate and inflation fluctuations, as the average CPI and exchange for each strategy varies depending on how many years are included in the hedge.

56 The years under consideration for each country case are not the same. This is for two reasons. First, growing seasons differ among the three countries. For Mexico and Uganda, harvest time straddles two separate calendar years, while for Brazil harvest time falls within one calendar year. Second, the coffee crisis began at different times, in 1998 for Brazil and Mexico and in 1999 for Uganda. See f.n. 49 for more information.
FIGURE 4.5: Mexico: Real income from coffee and hedging, 1999-2002, by strategy employed
(2007 Mexican pesos)
FIGURE 4.6: Brazil: Real income from coffee and hedging, 1998-2002, by strategy employed (in 2007 Brazilian reals)
Figure 4.7: Uganda: Real income from coffee and hedging, 2000-2003, by strategy employed (in 2007 Ugandan shillings)
I also include, below, a table indicating the variability of each income stream by strategy for all three case countries. The measure of variation is the coefficient of variation as in the prior section.

**Figure 4.8: Inter-seasonal income variability**  
*(coefficient of variation of annual income streams by strategy)*

<table>
<thead>
<tr>
<th>Hedging Strategy</th>
<th>Mexico</th>
<th>Brazil</th>
<th>Uganda</th>
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<tr>
<td>No hedge</td>
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<td>75.85</td>
</tr>
<tr>
<td>Rollover #1</td>
<td>75.88</td>
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<td>103.41</td>
</tr>
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<td>Rollover #2</td>
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<td>62.05</td>
<td>97.79</td>
</tr>
<tr>
<td>Rollover #3</td>
<td>30.97</td>
<td>44.41</td>
<td>66.59</td>
</tr>
<tr>
<td>Rollover #4</td>
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<tr>
<td><strong>Rollover annual</strong></td>
<td>26.35</td>
<td>34.21</td>
<td>82.25</td>
</tr>
</tbody>
</table>

Source: Author’s calculations

The data are highly suggestive. For Brazil and Uganda, Rollover #4 provides for the least inter-seasonal variation in income during the coffee crisis as determined by calculating the coefficient of variation of real annual income during this period. For Mexico, Rollover #4’s stability gains are beat only marginally by the plain annual and the annual rollover. Recall that Rollover #4 is a one-year hedge that begins towards the end of the crisis.

Several points might be made here. First, there is no advantage in these three cases, if inter-seasonal income stability is the goal, to starting a hedge at the beginning of a crisis. If one considers hedging as a form of income insurance for farmers, this finding is highly counterintuitive. Common sense dictates that insurance ought to be in place before such risky events occur—indeed, purchasing auto insurance today to cover
damages from an accident that has already happened is highly problematic. Yet, if income stability is the goal, coffee farmers in the three countries would have been best off if they used precisely this counterintuitive logic.

Second, rollover #4 has a duration of only one year. Hedging over the course of the entire crisis (as in Rollover #2, the plain annual and the rollover annual) resulted in more income instability than a rather limited hedge of short duration. If income stability is the goal, the data suggest that in these three cases during the duration of the crisis lower levels (shorter term) of insurance coverage are more beneficial than more comprehensive levels (longer term). This is also highly counterintuitive. Chapter 3 suggested the importance of farmers’ having continuous insurance coverage given the behavior of coffee prices. Yet, futures markets provide insurance in such a way as to make continuous coverage a disadvantage in stability terms.

However, even for Rollover #4, which stabilizes incomes to a greater extent than almost all other strategies in each case (again, in Mexico the plain annual and rollover annual hedges do a little bit better), the year to year variations are still quite large. Looking at the figures for Mexico, 2000’s income is about 80% of 1999’s; 2001’s income is under 60% of 2000’s; and, 2002’s income is close to 155% of 2001’s. For Brazil, 1999’s income is about 120% of 1998’s; 2000’s income is about 80% of 1999’s; 2001’s income is less than 70% 2000’s; and, 2002’s income is almost 120% of 2001’s. In Uganda, 2001’s income is roughly 30% of 2000’s; 2002’s income is roughly 140% of 2001’s, with 2003’s income showing only a slight decline relative to 2002. Thus, we cannot conclude that farmer incomes are stabilized from year to year to any great degree by the rollovers, even when using that particular strategy which stabilizes them most.
Put differently, this finding is consistent with the findings of Gardner (1989). He notes, “In a long sequence of routine hedges, the ability of any hedging technique to reduce the variance of receipts is questionable, and sequential rollovers are the most questionable of the alternatives considered” (Gardner 1989, 317). Peck makes a similar comment about futures hedging and long term income stability: “Futures markets operate with an essentially short-run horizon. Contracts are traded for at most a year in advance of their expiration, often for shorter periods. This is long enough to be as useful to producers as it is to the commercial trade. But, for most commodities, it is certainly not long enough to stabilize incomes in the sense used by the above authors [i.e. inter-seasonal stability] (Peck 1975, 410-11).”

It is also interesting that in each country case not hedging at all performed better than either Rollovers #1-2. In Brazil, not hedging performed better than Rollover #3, the plain annual and rollover annual hedges as well. Indeed, not hedging is a real possibility even in the ideal scenario constructed here where the farmer is assumed to be able to access futures markets without impediment. If the hypothetical farmer is a risk taker then she may prefer to ride out the storm in the hopes of taking advantage of high prices in the future (having a short hedge in place when future prices rise precludes a farmer from taking advantage of higher prices). Further “his [the farmer’s] expectations concerning future price might differ from that of the market” (Newberry and Stiglitz 1981, 167). If the farmer does not think the market is predicting the right future trends, or pricing them appropriately, then not hedging would be a safer bet. Expectations about the future and degrees of risk aversion are among those factors that might lead farmers to make different choices regarding the appropriate risk management strategy.
The nature of rollover hedging itself figures prominently in explaining the enormous variability of several income streams, particularly those generated via Rollovers #1-2. Recall that a rollover hedge, say for four years, requires that four years production be hedged the first year, three the second, two the third, and one the last. For example, I ask the reader to look at the real income earned via Rollover #2 in any of the country cases. The big gains in the first year, where multiple years of production are hedged at once, create excess income that can be saved as futures prices and hedged quantities decline in future years. In the Mexican case, almost 42% of the income earned from coffee and hedging between 1999-2002 is earned in that first year. In the Brazilian case, about 38% of the income earned from coffee and hedging between 1998-2002 is earned in the first year. For Uganda, the first year saw 55% of the total income from 2000-2003 accrue to the farmer. The very nature of rollover hedging thus introduces severe year-to-year variations in income. As will be seen below, these rollover strategies are very profitable relative to not hedging in the historical context examined here (this is also confirmed more generally in Dodd 2007). However, they appear unable to achieve both profitability and stability in the cases evaluated here.

These data further illustrate a rather alarming inter-year tendency. Putting aside income variability caused by the rollover technique, the annual hedges (both plain and rollover) illustrate the income variability introduced as a consequence of inter-year future price volatility. Peck notes that “For most commodities, inter-year variation in futures prices is as great as that in cash prices. Hence, reduction in income variation using a routine hedging procedure is apt to be small by these measures (Peck 1975, 410).” Recall that futures markets pay out when prices change. For a short hedger the bigger the price
fall, the larger the payout. In years when futures prices stagnate or even rally, the gains from hedging decrease dramatically or are turned into losses.

The impact of inter-year volatility on farmer income can be seen clearly in the case of the Mexican plain annual hedge. Below I present two graphs: real income from coffee sales and the plain annual hedge for the Mexican farmer; and, coffee “C” nearby future prices from ICE divided according to the Mexican crop year. Recall that I assume that the Mexican farmer withdraws hedging proceeds from his account each March, such that the period from March 1998-March 1999 on the price graph, for example, includes the gains represented as 1999 income in the income graph.
Looking at both future prices during the crisis as well as the proportion of the income gains from plain annual hedging that accrue during each year thereof, an important conclusion may be drawn. During years when futures prices fall dramatically, as in the March 2000-March 2001 period, the income gains from hedging are larger. The Mexican farmer earned 43% of hedging income during this period. By contrast, during years when prices stagnate, as between March 2001-March 2002, and during years when prices rebound, as between March 1999-March 2000, the income gains from hedging decline. The Mexican farmer earned only 21% of hedging income in the former period, and 15% in the latter (depending on the duration and magnitude of price rallies, these net annual figures could be negative).

In crisis scenarios, then, when future prices are highly volatile from year to year, sometimes falling precipitously, other times stagnating and still other times rallying, incomes become unstable. This is quite similar to the dramatic *intra*-seasonal income changes in Mexico and Brazil caused in part by frequent future price reversals. This
finding is all the more disheartening considering that income stability is arguably more important during in a crisis. It should also be noted that the years for which gains from hedging were relatively small (i.e. when prices rallied and/or stagnated) were also years in which actual coffee prices were also low—in the Mexican case, 2002 is a good example. In other words, there was no increase in income from coffee to offset the relatively diminished gains from the hedge. The fact that derivatives deliver little when future prices stagnate, failing to offset relatively lower incomes from coffee sales no matter how low those incomes may be, is a point of critical importance for policymakers. Indeed, the four annual hedges performed consecutively in the Mexican case resulted in a consistent year-to-year decline in real income, reinforcing Peck’s comment above about the difficulties of stabilizing incomes year-to-year using contracts of short duration.

The influence of inter-year future price volatility (or, conversely, the absence of distant futures markets) is also evident in the Brazilian and Ugandan annual hedges. In Brazil, the year in which coffee income was lowest (2002) was also the year in which income from hedging was lowest. In Uganda, falling income from hedging is paralleled by falling income from coffee, resulting in relatively high total income in the beginning of the crisis, and relatively low income in the last years of the crisis. Robusta coffee future prices fell more dramatically in the first two years of the crisis than they did in the latter two years, resulting in relatively unstable incomes as hedging income failed to offset losses in coffee income.

57 This is not to say that farmers would not have made up for their lost coffee income at some point. This was shown to be the case in hindsight for virtually all of the hedging strategies in the previous section’s discussion of the strengthening basis. However, what these inter-seasonal data tell us is that the timing of the gains from the hedge were mismatched to the movement of cash prices.
A summary chart of these empirical findings, for the reader’s reference, can be found in the “Conclusions” section at the end of this chapter.

**Farmer choices and income instability**

Many scholars recommend futures markets because they afford producers the opportunity to choose whatever type and amount of price protection they want. For theorists like Milton Friedman, this freedom to choose is the rationale *sin qua non* to get government out of the price risk management business. He implores: “But is it at all clear that their plan is better than straightforward reliance on a free market? Is it better than letting producers decide for themselves what investments they want to make and what lotteries they want to engage in (Friedman 1954, 703)?” My data suggests that this ‘freedom to choose’ is itself a potential source of income instability. This is so at the level of the individual farmer and from a broader policy perspective.

First and foremost, choice of strategy impacts the level of income stability obtained via hedging. The evidence suggests that there is a large range of possibilities (I have illustrated 5 strategies and there are many more additional possibilities) that result in varying levels of income stability. For farmers in Uganda, for example, the choice of Rollover #4 results in the least inter-seasonal income variability. But, in Uganda choosing the annual hedge resulted in less intra-seasonal income variability for the first year of the hedge. In some cases, then, intra- and inter-seasonal stability are conflicting goals. This compounds the significance of farmer choices.

The matter of strategy choice is also significant from a policy perspective. The large scope for farmer choice means from a policy perspective that *outcomes* will vary enormously when futures markets are recommended to farmers for income security.
purposes. If the policy objective is to provide income security to coffee farmers, futures markets will not deliver a uniform product. Outcomes will be very heterogeneous across individual farmers.

Seemingly mundane choices also matter for income stability. For example, within certain constraints farmers have to choose the precise trading days on which to perform the rollovers and close the hedge (e.g. when to buy back March 1999 contracts and sell July 1999 contracts, and when to buy back the final contract). If a farmer wants to rollover or close the hedge when the markets are most liquid, this preference does indeed limit the available number of days to do so. However, many days are still left for the farmer to choose from. Analyzing price, open interest and volume trends for one year preceding and several years into the coffee crisis in each country case (looking at relative prices and how they corresponded with open interest indicates when short-hedgers are getting out of the market), I was able to generate a range of days from which a short-hedging coffee farmer might reasonably choose. For Mexico, the range is between 0 and 25 days before the date of expiry of contract. For Brazil, 0 to 22 days appears reasonable. For Uganda, somewhere between 0 and 30 days seems appropriate.

If future prices were only mildly volatile, then choosing the day to close out the hedge for good (or the day to rollover the nearby contract into the 2nd nearby) would not be so difficult, nor would it have a big impact on income. But, futures prices vary significantly from day to day, meaning that the income gains from hedging vary accordingly. Below I present three graphs, one for each country, that indicate changes in the income gains from hedging from Rollover #1 when the hedge closing date is varied. Keep in mind that this constitutes only the final step in the rollover. Such a choice, about
the ‘right’ day, has to be made many times over the duration of the hedge—in the case of Rollover #2, about 27 times!

Figure 4.11

![Chart showing Mexico: Income gains from Rollover #1, varied by hedge closing date (in USD)]

Figure 4.12

![Chart showing Brazil: Income from rollover #1, varied by hedge closing date (in USD)]
How significant is the farmer’s choice here? For the Mexican farmer trading futures on ICE, between February 15, 2000 and March 21, 2000 (25 trading days), prices vary from a trough of US$0.988/pound (on 2/25/00) to a peak US$1.084 (on 3/7/00). Thus, the gains from the entire hedge vary from US$35,233 to US$31,633 respectively (when a farmer closes out the hedge he is ‘buying back’ a future to close up the account; short hedgers like to sell high and buy back low, much like short selling stocks). In other words, if a farmer closes out the hedge on February 25, she will earn over 11% more than if she closed out on March 7.

For the Brazilian farmer trading on the BM&F, between August 23, 1999 and September 22, 1999 (22 trading days), prices vary from a peak of US$0.9475/pound (on 8/23/99) to a trough of US$0.815/pound (on 9/22/99). The income gains for the entire hedge thus vary from US$16,230 to US$17,628. In other words, closing out on August 23 would generate just about 9% more income compared to closing out on September 22.
For Uganda, prices vary from a trough of US$0.261/pound (on 3/22/01) to a peak of US$0.295/pound (on 2/16/01), over the course of 30 trading days between February 16-March 30, 2001. This corresponds to a total income gain of about 4% if the hedge was closed on March 22 instead of February 16.

Inter-day volatility makes farmer choices about when to close out the hedge (or perform the rollover) difficult and significant in income terms. Making the “right” choice can raise or lower incomes relative to “wrong” choices, resulting in a highly choice-dependent income stream that may be more or less stable as a result. A hedge close date that reduces total income may be stability generating if prior years’ incomes are relatively lower. A hedge close date that raises total income may be stability generating if prior years’ incomes are relatively higher. Peck comments on these sorts of choices in the context of feeder cattle: “Like all anticipatory hedges, cattle feeders’ use of futures markets requires the exercise of judgment concerning price; that is, it is fundamentally a price-fixing decision. Prices look “good” today for the commodity that must be eventually bought or sold (Peck 1985, 20).”

Farmer choice and judgment is also crucial for other reasons. While futures trading itself has not in any of my cases or strategies eliminated income instability, farmers might in theory make certain decisions that render incomes more stable. Depending on how much a farmer and her family consumes, invests and saves in any given month or year, a fund might be accumulated in months or years of higher income and saved in order to smooth incomes in months or years with lower incomes. This possibility is a real one in the inter-seasonal context presented directly above, especially considering that incomes are relatively higher across virtually all hedging strategies in the first and second years of
the crisis. This suggests that some of this higher income might be saved and used to bolster incomes in the ‘leaner’ years that followed. Months of relatively higher income preceded months of low or negative income in Mexico and Uganda in the intra-seasonal context, suggesting the same potential for savings to act as an income smoothing mechanism.

Presumably with this in mind, Randall Dodd titled his 2007 paper on rollover hedging “From Fat Years to Lean Years: What if Joseph Had Used Derivatives?” He writes:

The story goes that Joseph interpreted the dreams of the Pharaoh, in which seven fat cows were followed by seven thin ones and seven plumb ears of corn were followed by seven poor ones, to be an economic forecast of seven bountiful years were to be followed by seven years of economic contraction. Joseph advised the leaders of Egypt to conserve output during the years of bumper harvests – called the “fat” years – by placing 20% of each harvest into government supervised granaries, and then to dispense the inventory during future “lean” years. This inventory hedge succeeded in stabilizing Egypt’s income and contributed to its peace and prosperity.

Yet, the situation of coffee farmers is generally quite different from that of Joseph. In particular, there is no one coming down from on high to tell coffee farmers how many fat years (or months) they will have and how many lean years (or months) will follow. Further, even if the general breakdown of fat and lean were known, it is still far from certain how much a farmer and her family should save as a reserve for less prosperous times (indeed, this was precisely the conundrum that resulted in the bankruptcy of buffer stock schemes in past times).

Part of the problem is that futures prices and cash prices are both volatile and difficult to predict with any degree of certainty. Even though future and cash prices are considered to be probabilistically knowable, with such probability distributions derived...
from those various techniques described in Chapter 3, it remains that future price predictions are frequently wrong. While scholars like Dodd have illustrated the profit-potential of hedging under certain market conditions, the extent and duration of these gains are thus unknown. The very same factors that might lead a farmer to hedge in the first place—uncertainty about the future—make it exceptionally difficult for producers to smooth incomes across months and years by making the “right” consumption and saving decisions.

One could imagine various decision rules that might be devised. For example, a family could spend in one year what they needed to in order to cover the family’s bare necessities, and then save the rest for later. Yet, from the perspective of well-being, only meeting bare necessities potentially perpetuates some of those conditions that contribute to the poverty of many small coffee farmers such as malnutrition, illness, illiteracy, problems obtaining new production technologies and learning new techniques, and so on.

As another option, like Joseph, the family could decide to save 20% of annual income. Yet, depending on the absolute level of income and the particulars of the given family, this decision might be welfare reducing if savings comes at the cost of expenditures on food, medical expenses, school fees, etc. The fundamental problem remains: How much should a family save each month or year in order to smooth future income streams? This problem is all the more critical for farmers that do not have other income-smoothing mechanisms available, like assets to sell, savings to deplete, loans to take out or other crops or off-farm work to pursue.
Income adequacy

The data generated above also tell about the absolute income gains from hedging and coffee sales for hypothetical Mexican, Brazilian and Ugandan coffee farmers. In this section I combine the data above with several insights from the next chapter (Chapter 5) to evaluate the adequacy of farmer incomes from hedging and coffee sales relative to production costs and international poverty lines. As will be seen, hedging can raise the incomes of coffee farmers relative to production costs and international poverty measures. It is odd that so few (only one that I have found) agricultural development researchers recommend futures hedging on this basis. Arguably, the strongest case for futures hedging might be made with reference to the incredible income gains it can produce during times of crisis.

The table below illustrates the absolute, real income gains from hedging and coffee sales, disaggregated by hedging strategy employed, for farmers of average size and output levels in the three case countries. Speaking about the adequacy of income of a hypothetical farmer makes little sense. So here I skip ahead and incorporate some of the insights of the next chapter into this analysis so that a more realistic picture of adequacy emerges. Whereas the stability and certainty gains from hedging remain the same irrespective of farm size, absolute income levels do not. Average farm sizes (and corresponding output levels) in all three cases are much smaller than the hypothetical farms that formed the basis for the calculations above. The absolute income gains from hedging and coffee sales are proportionately reduced as farm size decreases.  

58 I assume that there are no economies of scale in coffee production. In Brazil, where the large fazendas often utilize mechanized harvesting techniques, some economies of scale are evident. However, assuming
Here I am proceeding as if all farmers of average size in the three case countries could actually participate in futures markets with their small output levels. Please keep in mind that this exercise is thus largely hypothetical at the present time. The next chapter shows that the vast majority of Mexican and Ugandan farmers are unable to use futures markets individually or through an intermediary, and a sizeable contingent of Brazilian farmers are unable to do so.

**Figure 4.14: Real annual income from coffee and hedging for coffee farmers of average size, 1998-2003, by hedging strategy employed**

<table>
<thead>
<tr>
<th>Real Income Year</th>
<th>No Hedge</th>
<th>Rollover #1</th>
<th>Rollover #2</th>
<th>Rollover #3</th>
<th>Rollover #4</th>
<th>Plain Annual</th>
<th>Rollover Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEXICO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average farm size = 2.7 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in 2007 Mexican pesos, rounded to nearest peso)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>34182</td>
<td>69617</td>
<td>88497</td>
<td>34182</td>
<td>34182</td>
<td>42676</td>
<td>47761</td>
</tr>
<tr>
<td>2000</td>
<td>27807</td>
<td>31971</td>
<td>39122</td>
<td>27807</td>
<td>27807</td>
<td>33594</td>
<td>31579</td>
</tr>
<tr>
<td>2001</td>
<td>16063</td>
<td>16063</td>
<td>53404</td>
<td>34275</td>
<td>16063</td>
<td>33010</td>
<td>34733</td>
</tr>
<tr>
<td>2002</td>
<td>15823</td>
<td>15823</td>
<td>26007</td>
<td>15823</td>
<td>24835</td>
<td>24296</td>
<td>26007</td>
</tr>
<tr>
<td>Totals</td>
<td>93875</td>
<td>133473</td>
<td>207030</td>
<td>112087</td>
<td>102887</td>
<td>121593</td>
<td>140080</td>
</tr>
<tr>
<td>BRAZIL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average farm size = 4.9 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in 2007 Brazilian reals, rounded to nearest real)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

there are no economies of scale can only bias the above results in favor of the income adequacy contributions of futures—i.e. the assumption will bias the incomes of smaller farmers upwards.

59 The years under consideration for each country case are not the same. This is for two reasons. First, growing seasons differ among the three countries. For Mexico and Uganda, harvest time straddles two separate calendar years, while for Brazil harvest time falls within one calendar year. Second, the coffee crisis began at different times, in 1998 for Brazil and Mexico and in 1999 for Uganda. See f.n. 49.

60 See data and sources in Chapter 5’s discussion of farm size. Also, see f.n. 58.

61 See f.n. 58.
Looking to the table, each cell indicates the real annual income earned by a farmer of average size for a specific year and a specific hedging strategy. For example, the cell in the upper left corner of the Mexican portion of the table notes that a Mexican Arabica farmer with a farm of average size producing average yields would have earned $34,182 2007 Mexican pesos. Moving one cell to the right, the same farmer would have almost doubled his real 1999 income if he had utilized Rollover #1. Moving one cell further right shows that this same farmer would have more than doubled his real 1999 income if he had used Rollover #2 instead of not hedging.

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62 See f.n. 58.
To start, all of the gains from hedging were positive for the duration of the crisis for each case country, meaning that *any of the hedging strategies, including the annual hedge, would have improved upon the status quo* (not hedging) in terms of absolute income levels. The positive gains from all of these strategies and across all three countries generally corroborates Dodd’s recent suggestions about the “profitability” of rollover futures hedging for several commodities including coffee (Dodd 2007). My data illustrate this possibility across several different rollover strategies as well as for a series of annual hedges under conditions of falling futures prices. It is thus reasonable to suggest that hedging with futures in an environment of falling prices can improve farmer well-being by raising incomes. The ability of futures hedging to raise incomes during times of crisis is a point that has been overlooked by many of its proponents, seemingly a consequence of a too-narrow conception of income security.

That said, the income level achieved via each strategy differed enormously. In each case country, Rollover #2 performed best in absolute terms over the years of the coffee crisis. Rollover #2 more than doubled income relative to not hedging in the Mexican case. This was also the case in Brazil. In Uganda it more than tripled income from only coffee sales. This crucially suggests that a single hedging strategy may not be effective at both stabilizing and raising income. Indeed, Rollover #4, which was found to best

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63 Dodd uses the word “contango” to describe those market conditions under which short rollover hedging will be profitable. Contango describes a relation between cash and future prices such that future prices are higher than cash prices at a given point in time. If we accept that future and cash prices must converge at the contract’s expiration and that cash price movements are independent of future price movements (but not vice versa), then this implies that over time the future price must fall and generate profits for short hedgers. The opposite of contango is “backwardation”, a situation where the cash price is higher than the future price at a given point in time. Backwardation can sometimes be found in metal and oil futures markets. In an efficient market, the differential between cash and future prices equals the returns to storage. These returns are positive in a contango market and negative in a backwardated market.
stabilize farmer incomes across multiple crop seasons in Brazil and Uganda, performs most poorly in absolute terms. By contrast, Rollover #2 performed best in absolute terms, but was among the worst strategies for stabilizing incomes in all three cases. In Mexico, the annual hedge was the best strategy for stabilizing inter-seasonal income flows, but performs relatively poorly in absolute terms relative to Rollover #2.

Again, farmer choices about which kind of hedging strategy to employ significantly impacts outcomes. In this case, the absolute income gains from hedging vary widely across strategies, much as the stability and certainty gains varied widely in the discussion above. Recall from that discussion that the significance of choice was troublesome from an individual and policy perspective. In the individual case choice can impact income levels, and thus consumption and investment opportunities. From a policy perspective, hedging with futures does not deliver a uniform product and cannot be relied upon to consistently raise incomes by predictable amounts. That said, I do not want to diminish the central point made thus far: futures hedging can be wildly profitable, with incomes increasing by almost 200% in some cases relative to not hedging at all.

Yet, the absolute income data presented above tells nothing about whether this income is *enough* relative to the needs of coffee farmers and their families. Ascertaining whether incomes are “adequate” to the needs of farmer and family requires some kind of comparison. Below I compare the average farmer’s absolute income to average production costs and two international poverty lines, the one dollar per day “extreme” poverty line and the two dollars per day “moderate” poverty line. These have both been established by the World Bank and incorporated into the UN’s Millennium Development Goals (more below). The table below compares the absolute income gains from hedging
with average coffee production costs and also translates the gains from hedging into international dollars for the international poverty line comparisons.

**Figure 4.15 Real total income comparisons for farmers of average size in Mexico, Brazil and Uganda, 1998-2003**

<table>
<thead>
<tr>
<th>Costs, Expenditures and Poverty Lines →</th>
<th>Coffee crisis production costs (for farmer with average yield)(^6)</th>
<th>2007 international dollars per day per family member(^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years and Countries ↓</td>
<td>As a % of real total income from coffee and hedging</td>
<td>NH = no hedge. #1-#4 = Rollovers #1-4. PA = plain annual. RA = rollover annual</td>
</tr>
</tbody>
</table>

\(^6\) For Mexico, ITF (2002, 20) notes that in 2002 production costs ranged from 6500-8000 pesos per hectare. I utilize the lowest end of the range to give futures the benefit of the doubt. I converted 2002 pesos to 2007 pesos to come up with 7935 real pesos/ha/annum or 21425 real (2007) pesos/annum for the average-sized farmer. I assume that production costs remain constant. In reality, production costs fluctuate, especially due to oil price fluctuations (oil is a primary ingredient in many fertilizers).

For Brazil, the trade journal *Tea & Coffee* notes that production costs in western Bahia are very competitive relative to other production zones, and in March 2002 were roughly 71 US cents/kg or 33 US cents/lb. See: [http://www.teaandcoffee.net/0302/world.htm](http://www.teaandcoffee.net/0302/world.htm) (Accessed on 8/20/2008). I converted 2002 dollars into 2007 reals to come up with production costs of roughly 1.09 reals/pound. For the average farmer farming 4.9 ha with average yields, this amounts to 10,093 real (2007) reals/annum.

For Uganda, Benin and You (2007, 13) note that Robusta production costs in Uganda (for traditional, not clonal varieties) for the 2002/3 crop season were 420 shillings/kg (in 2000 USh). This amounts to 261 real 2007 shillings/pound, or 77,778 real (2007) shillings/annum for a farmer with average yields farming 0.2ha.

In each country case the production costs do reflect the cost of hired labor. However, to the best of my understanding they do not include the proprietor’s salary or family labor applied (i.e. the costs of reproducing the farmer and family are not included).

\(^5\) Here I convert total 2007 local currency incomes into 2007 international dollars using the conversion factors provided in the UN’s MDG Indicator data set (the conversion factors extended only through 2006, so I use 2007 forecasts generated via a linear regression; the conversion factor is meant to create purchasing power parity (PPP) across different currencies at a given point in time). This amount is divided by the average number of household members and then divided by the number of days of the coffee crisis for each country case (1460 days for Mexico and Uganda and 1825 days for Brazil). “One dollar per day” was formulated in the context of the Millennium Development Goals (MDGs) and is widely utilized by international development organizations as a global indicator of extreme poverty. See [http://www.un.org/millenniumgoals/](http://www.un.org/millenniumgoals/) for info on the MDGs. Keep in mind that the $1/day in the MDGs is based on 1993 PPP, i.e. living on less than one dollar per day in 1993 is considered extremely poor (see Pogge 2003). This means that the cut-off for extreme poverty in 2007 is more than $1/day. Again, this can only make my results appear more favorable for futures market advocates.

According to Potts’ study of coffee farmers in Brazil and Uganda the average Brazilian coffee farming family has 5 members, while the average Ugandan coffee farming family has 12 members (2007, 71). Davis notes that 75% of Mexican agricultural producers are *ejidatarios* (peasants farming communal lands called *ejidos*) (2000, 100) and Davis, Stecklov and Winters’ study of Mexican ejido producers revealed for a sample of over 5,000 producers that family size was almost 6 people on average (2002, 296). Note that I am considering only income from hedging and coffee (consistent with the rest of the analysis).
### MEXICO: 1999-2002

<table>
<thead>
<tr>
<th>NH</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>PA</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>91%</td>
<td>64%</td>
<td>41%</td>
<td>76%</td>
<td>83%</td>
<td>64%</td>
<td>61%</td>
</tr>
<tr>
<td>$1.31</td>
<td>$1.86</td>
<td>$2.88</td>
<td>$1.56</td>
<td>$1.43</td>
<td>$1.86</td>
<td>$1.95</td>
</tr>
</tbody>
</table>

### BRAZIL: 1998-2002

<table>
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<tr>
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<th>#3</th>
<th>#4</th>
<th>PA</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>68%</td>
<td>47%</td>
<td>27%</td>
<td>58%</td>
<td>65%</td>
<td>45%</td>
<td>42%</td>
</tr>
<tr>
<td>$5.06</td>
<td>$7.34</td>
<td>$12.90</td>
<td>$5.95</td>
<td>$5.28</td>
<td>$7.66</td>
<td>$8.13</td>
</tr>
</tbody>
</table>

### UGANDA: 2000-2003

<table>
<thead>
<tr>
<th>NH</th>
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<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>PA</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>51%</td>
<td>27%</td>
<td>17%</td>
<td>36%</td>
<td>45%</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>$0.05</td>
<td>$0.09</td>
<td>$0.16</td>
<td>$0.07</td>
<td>$0.06</td>
<td>$0.08</td>
<td>$0.08</td>
</tr>
</tbody>
</table>

Looking to the table, each cell indicates how well the incomes earned from just coffee sales and with each of the five hedging strategies measured up to average farm production costs and the two international poverty measures. For example, the bottom left cell illustrates the portion of total production costs during the crisis that were covered by each strategy for the Ugandan farmer. Covering production costs required over 50% of real income if the farmer did not hedge. Rollover #2 resulted in only 27% of income being devoted to production costs. Moving one cell to the right, the table indicates the real total income per Ugandan family member per day for each strategy. Not hedging resulted in each family member living on only five 2007 international cents per day, while Rollover #2 raised the income per day to sixteen cents.

During the coffee crisis observers frequently commented that coffee prices had slipped well below production costs resulting in mounting farm debts, with farmers in some cases deciding not to harvest their crops at all. One way to measure the adequacy...
of farmer incomes is thus to compare them to production costs. Keep in mind that production costs do not include compensation for family labor, only for hired labor. This suggests that family consumption and investment is dependent on the balance remaining when costs are deducted from incomes.

The table above depicts real total production costs (country averages) as a proportion of real total income from the crisis for a farmer of average farm size and output. Looking at the results for not hedging (NH in the table) the reader can get a sense of just how low prices and incomes fell during the crisis. Over the entire period under consideration, production costs ate up over 90% of the Mexican farmer’s total income, 68% of the Brazilian farmer’s income and 51% of the Ugandan farmer’s income. Yet these figures conceal those individual crop seasons when production costs exceeded income from coffee sales: the 2000/1 and 2001/2 crop seasons in Mexico where costs were over 130% of income; the 2001/2 crop season in Brazil where costs just exceeded income; and, the 2001/2 crop season in Uganda when costs were over 135% of seasonal income.

Looking at the hedging strategies in each country case it is clear that each strategy improved upon not hedging, resulting in smaller proportions of income being spent on production costs. Rollover #2, the best income generating strategy, resulted for the average Mexican farmer in the proportion of income spent on production costs falling from 91% to 41%; in Brazil, the proportion dropped from 68% to 27%; and in Uganda from 51% to 17%. In each case Rollover #4 performed most poorly.

The Brazilian case is interesting as well insofar as it illustrates the potential conflict between profitability (highest absolute income level) and adequacy relative to production costs. Given the timing of the crisis and the Brazilian crop season, the most profitable
rollover (#2) failed to generate sufficient income during the 2001/2 season to cover production costs. However, Rollover #4 and the annual hedge, while dwarfed by #2’s profitability over the entire crisis period, provided sufficient income to cover production costs during the only crop season when coffee income was inadequate to do so. The timing of each strategy relative to cash price troughs is thus an important consideration for adequacy. The most profitable strategy may nonetheless be inadequate to farmer needs.

Turning to the international poverty lines, the Millennium Development Goals (MDGs) have been widely debated since their adoption in 2000. The first MDG—“reduce by half the proportion of people living on less than a dollar a day”—has been the object of both praise and criticism. One dollar per day or less is considered to be “extreme poverty” by the World Bank (which devised the measures) and two dollars per day or less is considered “moderate poverty”. Both are consumption-based poverty lines. While some suggest the goal is a visionary, achievable step towards the eradication of global poverty (e.g. Sachs 2005), others are quick to point out several flaws in the goal’s formulation. For the purposes of this discussion, one particular set of criticisms are especially relevant.66

Critics of the first MDG often point to problems with how the World Bank’s $1/day measure captures income poverty. For example, Pogge points to the Bank’s method of translating buying power and consumption patterns across time and space as being seriously flawed: “If we think of the extremely poor as those who lack minimally

66 The criticisms I mention here are certainly not exhaustive. For many critics the very exercise of trying to quantify poverty is objectionable. See Vigorito 2003 and Cariboni 2005 for more information.
adequate access to basic necessities, then we must conclude that, even if the World Bank’s poverty line were adequate for the US, where food is cheap relative to services, the Bank, by using general-consumption PPPs for converting its IPL into national poverty lines, may still have greatly undercounted the poor in many poor countries where food is more expensive relative to services than it is in the US (Pogge 2003, 8).” Writing for the non-profit Social Watch, Vigorito concurs: “This extreme line of poverty of the WB [sic, World Bank] is conservative, as people who are considered poor by national standards are not considered so when using this poverty line (2003).”

In terms of the adequacy analysis undertaken here, such criticism actually makes my comparison stronger. Indeed, no one ever suggests that one dollar per day is too much. If the gains from futures hedging do not measure up even to this highly conservative measure of adequacy, then these instruments are surely lacking relative to more generous and robust poverty measures.

Looking at the data presented in the table above a wide divergence in outcomes can be discerned across countries and across hedging strategies. A Brazilian coffee farmer and each of her family members working a plot of land of average size with average yields fared far better during the coffee crisis than either of her Mexican or Ugandan counterparts. Across all strategies, income per household member per day ranged from roughly $5-$13, a range located well above the $1 and $2 per day cut-offs. Consistent with my comments throughout about the importance of farmer choices, here strategy choice determines how close to the moderate poverty line each household member lies.

Keep in mind that the average Brazilian farmer produces more coffee per year than farmers in Mexico and Uganda (due to both higher yields and larger farm sizes), on
average has fewer household members (5 in Brazil; 6 in Mexico; 12 in Uganda), and utilizes a different derivatives exchange. These factors collectively contribute to the differing outcomes across countries. Note that even when not hedging the Brazilian farmer is more than $3 per day above the moderate poverty line. Throughout Gresser and Tickell’s 2002 report on the coffee crisis, Brazilian farmers are characterized as suffering relatively less overall than farmers in Central America and Sub-Saharan Africa. To some extent, the characterization appears warranted (despite the fact that small Brazilian coffee farmers, while not a numerous as in Mexico and Uganda, did experience severe hardship—see Watson and Anchinelli 2008).

It is also important to keep in mind that this comparison to the international poverty line does not take into account production costs. Once production costs are factored in, all strategies become less effective by the $1 and $2 per day measure. For example, once production costs are accounted for, Rollover #2 in Brazil provides each family member with only $9.44 per day (compared to $12.90 without taking production costs into account). Indeed, if the Brazilian farmer does not hedge, each family member earns only $1.61 per day after costs are deducted. While Brazilian farmers may not have suffered to the same degree as farmers elsewhere during the crisis, hardship was indeed a reality—$1.61 per person per day is “moderate” poverty according to the World Bank. Rollover #4 keeps the Brazilian family in moderate poverty as well once costs are accounted for. Rollovers #1-3 and the annual hedge push the Brazilian farmer and family out of moderate poverty. I will not repeat this exercise for the remaining cases, as the implications of factoring costs into these comparisons are already clear.
The international poverty comparisons in Mexico are more bleak than in Brazil. A coffee farmer and each of his family members working an average-sized plot with average yields would have, almost regardless of the hedging strategy chosen, existed between moderate and extreme poverty for the duration of the crisis. Without hedging each family member had $1.31 to consume per day (this broadly supports condemnation of the crisis by the ICO and non-profits like Oxfam on the grounds that coffee oversupply pushed hundreds of thousands, if not millions, of coffee farmers around the world into poverty). Further, of the five strategies tested only one, Rollover #2, elevated family members above the moderate poverty line. Five out of six strategies left farmer and family destitute.

In Uganda the comparison is cause for serious concern. Of the three cases, Uganda represents the smallest farms, the poorest yields, the largest families, and the most inferior coffee (in terms of quality and price). And like the other two cases a different derivatives exchange is used. Across all strategies, not a single one of them raised daily income per person over sixteen cents per person per day. On the World Bank’s own miserly terms hedging with futures makes virtually no headway towards poverty alleviation. This is truly surprising given that it is the Bank that has been futures markets’ strongest advocate to date in the developing country agricultural context.

The two attempts to gauge income adequacy that I have made are certainly not exhaustive of the possibilities. It would seem that further comparison may be warranted in the future as policy debates continue to unfold. In particular, household surveys indicating consumption, savings, and investment habits of coffee farmers and families may provide additional means to do so.
Overall, the evidence presented above is both heartening and disconcerting. While hedging in all cases raised farmer incomes, in some cases very substantially, the cases of Mexico and Uganda illustrate that hedging by itself will not necessarily ensure the adequacy of farm income to the needs of small coffee farmers and their families.

While several strategies in each case country allowed farmer to (more than) cover production costs, almost no strategy in Mexico and Uganda pushed farmer and family over the moderate poverty threshold of $2 per day. In Uganda, every strategy left farmer and family in extreme poverty. And even in Brazil where income per person was highest, the farmer and her family members were still in moderate poverty after accounting for production costs. The use of income adequacy as an evaluative criterion thus casts some doubt on the quality of the income security service provided by futures hedging. In other words, while it can greatly raise incomes relative to just selling coffee in the cash market, hedging alone cannot ensure the adequacy of farmer incomes to meet necessary expenditures on family needs or farm operations. Futures markets are not stand-alone vehicles for the alleviation of income poverty in this context.

In Chapter 6 I generate empirical evidence that allows for a comparison of the absolute income gains from hedging with the absolute income gains from several income security alternatives: supply management and Fairtrade. This gives an indication of how hedging measures up to other strategies, in addition to the evidence here about how the technique measures up to the needs of farmers and their families.
Conclusions

The data generated in this chapter speak to the quality of the income security services provided by futures hedging for coffee farmers in Mexico, Brazil and Uganda. Recall that by ‘quality’ I mean the degree to which futures hedging addresses the multidimensional coffee farmer income problem. Although the farmer income problem was argued in Chapter 2 to have four dimensions in total, this chapter considered only three of them. Two dimensions, stability and certainty, were suggested by proponents of futures markets themselves. Many researchers argue that futures hedging can make farmer incomes more predictable, more stable, or both. The other dimension considered here—adequacy—was included because futures hedging raises farmer incomes according to my calculations despite the fact that few researchers recommend them to policymakers on this basis.

Overall, the data allow me to make the following statement about the ability of futures hedging to provide income support for coffee farmers in Mexico, Brazil and Uganda: The impact of hedging with futures on the stability, predictability and adequacy of coffee farmer incomes is ambiguous. Under certain conditions using certain strategies, farmer incomes are stabilized and made more certain by hedging relative to the income streams derived from selling coffee in the cash market with no hedge in place. Yet, under certain conditions using different strategies, farmer incomes are destabilized and falsely predicted thereby. Futures hedging holds the further promise of raising farmer incomes, but stops short of ensuring their adequacy.
The ambiguous impact of futures hedging on coffee farmer income security is captured in the summary chart below. Recall that a major goal of this chapter was to answer the following question: “What exactly can futures hedging do for the incomes of coffee farmers?”

The chart is for the reader’s reference and provides a brief synopsis of the empirical evidence discussed in the chapter.

The reader should note one particular point about the summary chart. Looking to the right-hand side, the columns indicate whether any of the hedging strategies lifted farmers out of extreme or moderate poverty. In the case of Mexico, not hedging was already sufficient to lift family member incomes above $1 per day. Thus, none of the hedging strategies did so. In the case of Brazil, not hedging was already sufficient to lift family member incomes above $2 per day. Thus none of the hedging strategies lifted any family member out of moderate or extreme income poverty because they were never in extreme or moderate income poverty.
Figure 4.16: Summary chart: The income certainty, stability and adequacy gains from hedging, by strategy, in Mexico, Brazil and Uganda

<table>
<thead>
<tr>
<th></th>
<th>STABILITY</th>
<th>CERTAINTY</th>
<th>ADEQUACY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crisis onset</td>
<td>Time into the future that</td>
<td>Basis risk undermines certainty about</td>
</tr>
<tr>
<td></td>
<td></td>
<td>incomes are made more</td>
<td>minimum income?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>predictable (note that</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>timing of receipts are</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>not certain in any case)</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No hedge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rollover #1</td>
<td>Spring 1998</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Rollover #2</td>
<td>No, destabilized</td>
<td>No, destabilized</td>
<td>2 years, but not in short run</td>
</tr>
<tr>
<td>Rollover #3</td>
<td>n/a</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Rollover #4</td>
<td>n/a</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Plain annual</td>
<td>Yes</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Rollover annual</td>
<td>No</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Brazil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No hedge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rollover #1</td>
<td>Spring 1998</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Rollover #2</td>
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<td>No, destabilized</td>
<td>2 years, but not in short run</td>
</tr>
<tr>
<td>Rollover #3</td>
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<td>No, destabilized</td>
<td>4 years, but not in short run</td>
</tr>
<tr>
<td>Rollover #4</td>
<td>n/a</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Plain annual</td>
<td>No, destabilized</td>
<td>No, destabilized</td>
<td>One year</td>
</tr>
<tr>
<td>Rollover annual</td>
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<td>No, destabilized</td>
<td>One year</td>
</tr>
<tr>
<td>Uganda</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No hedge</td>
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<tr>
<td>Rollover #1</td>
<td>Spring 1999</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Rollover #2</td>
<td>No, destabilized</td>
<td>No, destabilized</td>
<td>2 years, but not in short run</td>
</tr>
<tr>
<td>Rollover #3</td>
<td>n/a</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>Rollover</td>
<td>n/a</td>
<td>Yes</td>
<td>One year</td>
</tr>
<tr>
<td>#4</td>
<td>Plain annual</td>
<td>Yes</td>
<td>No, destabilized</td>
</tr>
<tr>
<td>----</td>
<td>--------------</td>
<td>-----</td>
<td>-----------------</td>
</tr>
<tr>
<td>Rollover annual</td>
<td>Yes</td>
<td>No, destabilized</td>
<td>One year</td>
</tr>
</tbody>
</table>

The chart suggests that the following “best income security case” for futures hedging relative to the coffee producer income problem can be gleaned from my data and calculations:

1. Under the right market conditions and using the right strategy, futures hedging can stabilize income relative to not hedging within a single crop season. This can be empirically supported in the Mexican and Ugandan cases, but not in Brazil.

2. Under the right market conditions and using the right strategy, futures hedging can stabilize income relative to not hedging across multiple crop seasons. This can be empirically supported in all three country cases.

3. If the basis stays constant or strengthens over the course of the hedge, rollover futures hedging can allow farmers to predict their minimum incomes several years into the future. This can be empirically supported in all three country cases.

4. If the basis stays constant or strengthens over the course of the hedge, annual hedging can allow farmers to predict their minimum income up to a year in advance. This can be supported in both Mexico and Brazil, but not in Uganda.

5. Under the right market conditions and using the right strategy, futures hedging can be profitable for farmers, raising their incomes during times of crisis. This can be empirically supported across all three country cases.
6. Under the right market conditions and using the right strategy, futures hedging can lift coffee farmers above the moderate poverty threshold of $2/day. This can be empirically supported only in the Mexican case.

Relative to the assertions of various agricultural development researchers, the evidence suggests that futures hedging can do both more and less than proponents suggest. Futures markets can be used to stabilize incomes, can be used to gain more certainty about future incomes, and can raise incomes. However, they can also be a source of income instability and false income predictions. In addition, the evidence suggests that the contributions of futures hedging to farmer income adequacy, while substantial, are in some cases insufficient by even the most meager standards.

The ambiguity of hedging’s impact on farmer incomes may alone be enough to evoke caution from policymakers. Yet, my analysis also suggests at the very least the following additional points, various caveats and qualifiers made throughout that temper this best case:

1. While various hedging strategies can address all three aspects of the producer income problem addressed here, no single strategy can address all three dimensions simultaneously. This can be empirically supported in all three country cases.

2. Certain hedging strategies can severely destabilize farmer incomes both within and across crop seasons relative to not hedging at all. This can be empirically supported in all three country cases.

3. The strategies that raise farmer incomes most are the very strategies that are most destabilizing both within and across crop seasons. This can be empirically supported in all three country cases.
4. Basis risk can undermine the income predictive capacity of futures markets. This can be empirically supported in all three country cases.

5. Future price volatility (intra-day, inter-day, intra-year, inter-year) makes farmer choices very significant in income security terms. Choice of strategy and choice of rollover and hedge closing dates, among many other choices, introduce significant variation into the income outcomes of futures hedging. While no market guarantees individual outcomes, it bears reiterating that this is also the case with futures markets. This can be empirically supported in all three country cases.

6. Future price volatility is responsible for some of the intra-seasonal and inter-seasonal income instability that results from hedging, and can undermine the ability of futures hedging to provide income support during times of crisis. This can be supported in all three country cases.

7. The absolute income gains from hedging do not accrue to farmers during periods when futures prices are stagnant or rallying. This can result in a lack of income support during those crisis times when income support may be most necessary due to low, stagnant prices. It can also result in inter-year income instability. This can be empirically supported in all three country cases.

8. While futures hedging can raise incomes, in only one instance was futures hedging sufficient to move a coffee family member out of moderate or extreme poverty—the case of Rollover #2 in Mexico. In no other case (i.e. no other country and no other strategy) was futures hedging sufficient to move a coffee family member out of either extreme or moderate income poverty.
The deep ambiguity of these empirical results in relation to the producer income problem raises a crucial policy question, one often taken for granted by agricultural development researchers: Do futures markets as income security arrangements warrant the limited time, energy and resources of agricultural policymakers in the developing world, farmers, international organizations and other actors?

Not only are futures markets capable of both more and less than their proponents suggest they are, but the data suggest that futures hedging can be a source income insecurity for producers. The answer to the question above is thus not a foregone conclusion. Even the best case warrants caution on the part of policymakers and leaves room for doubt.

The next chapter proceeds to analyze futures markets from the perspective of access for small producers.
CHAPTER FIVE
Futures market access and income inequality

“It’s all right to tell a man to lift himself by his own bootstraps, but it is a cruel jest to say to a bootless man that he ought to lift himself by his own bootstraps.”
-Dr. Martin Luther King, Jr.\(^67\)

“To assume that the farmers, even the big farmers, can become players in these highly complicated financial markets...would amount to taking leave of common sense.”
-Kamal Kabra\(^68\)

Introduction

The previous chapter endeavored to illustrate and evaluate the contributions of hedging with futures to the stability, certainty and adequacy of coffee farmer incomes in Mexico, Brazil and Uganda. The analysis was made possible in part thanks to a variety of assumptions made about farmers themselves and the nature of their operations. These assumptions collectively eliminated obstacles to farmer access to futures markets. Recall that making these assumptions was intended as a methodological way to give advocates the benefit of the doubt in the context of futures markets and income security, as well as establish a basis for drawing a “best case” portrait of the income security services provided by futures hedging.


\(^68\) Indian Standing Committee on Food, Consumer Affairs and Public Distribution, 2006: 16-17, emphasis added; GET THIS CITATION RIGHT
This chapter departs from the method of the prior chapter, embarking upon an analysis and discussion of the access-related assumptions made previously and how they compare empirically to the actual situation of Mexican, Brazilian and Ugandan coffee farmers. In the subsections that immediately follow I interrogate these assumptions and describe and discuss their applicability to the situations of coffee farmers in the three case countries. As will be seen, all of the access related assumptions are problematic in each country context, most so for small producers, though to varying degrees and for varying reasons.

As noted in Chapter 2, this chapter answers the following questions: What is the nature and extent of farmer access problems vis a vis futures markets? And, do these findings bear upon the policy viability of futures markets as an income security arrangement for coffee farmers? As has been the case up to this point, I focus especially upon the plight of small coffee farmers in their attempts to access these markets.

The second portion of the chapter discusses whether or not access is important from the perspective of farmer welfare. I first address the contention of some economists that farmers do not require the ability to hedge in order to benefit from futures markets. I then discuss the matter of futures market exclusion for small versus large farmers. Existing evidence suggests that small farmers are more negatively affected by such exclusion than their larger counterparts.

The third portion of the chapter addresses the remaining (fourth) dimension of income insecurity identified previously: income (in)equality. Drawing upon the discussion of access in the first part of the chapter, I explain and discuss the potential impact of futures hedging upon the distribution of income both among farmers of
different types, and among various actors along the GCCC. As was also the case in Chapter 4, the import of hedging for relative income dynamics is not straightforward. In some cases, access obstacles can be a vehicle for a worsening distribution of income, as small farmers in particular are excluded from profitable opportunities. In other cases, exclusion from futures hedging may actually improve (small) farmers’ relative income position vis a vis other actors that do hedge.

In the second section directly below I discuss access and related obstacles in the three case countries. This section is quite large and I utilize topical subheads for ease of reading. The third section discusses the importance of access from two different perspectives. The fourth section analyzes futures market access and income inequality. The fifth section concludes with some summary remarks and implications for policymaking.

**Access and other obstacles to effective farmer use of futures markets**

The purpose of this section is to contrast the assumptions made about coffee farmer characteristics and farm operations in the previous chapter with the actual situation of coffee farmers in Mexico, Brazil and Uganda. Recall that these assumptions collectively eliminated many access and other obstacles to effective futures market use, obstacles that many farmers face in reality to varying degrees. Put differently, in this chapter I subject the assumptions to greater scrutiny and elucidate the unique contours of access and related difficulties in each country case. Again, these assumptions and a detailed discussion of them can be found in Chapter 2’s discussion of research methodology.
As also noted in Chapter 2, agricultural development researchers often exhibit intense optimism in regard to the access problems discussed below. In some cases, such optimism appears as avoidance of the issue altogether or, if not total avoidance, only a brief mention of the matter. For example, a 2002 UNCTAD study on farmer use of “modern financial instruments” generally endorses the use of derivatives in the developing country agricultural context: “...these markets could greatly help developing country farmers to improve their lives … (2002, 3).” Buried on pages 30-31 (out of 36) is short listing of access obstacles roughly one paragraph in length (UNCTAD 2002). The next paragraph goes on to suggest to farmers’ associations that the elimination of these obstacles are not only possible, but also worthy of their time, energy and resources. While the general problem of “access” is indeed mentioned towards the beginning of the document (and in most other policy discussions of the topic), no detail is provided nor is there any indication as to the nature and severity of the problem. Such ‘glossing over’ of access problems serves to marginalize and diminish the importance of the issue in policy debates.

In other cases, such optimism is suggested in presentations that have the effect of diminishing the nature and scale of access problems. For example, a policy note from World Bank researchers detailing the prospects for market-based risk management in developing country agriculture accounts for only two of the five access problems that I identify below (World Bank 1999, 2). In only briefly mentioning the problem of sufficient “know-how” and small farm sizes, other obstacles like yield risk, cost and information are not considered at all. As will be seen below, these remaining three obstacles (and there are likely more) are serious ones in all three country contexts.
Acknowledging the enormity of futures market access problems in the three country contexts is crucial for effective policymaking. In particular, policymakers would do well to ask whether or not limited resources ought to be allocated towards the rectification of problems this substantial, particularly when there may be better alternatives available. I return to the matter of alternatives in Chapter 6.

In what follows below I attempt to draw a detailed picture of the nature, scope and depth of those access problems indicated by the assumptions made in the previous chapter. I address, in order: farm size and output levels, yield risk, trading costs, information obstacles and knowledge obstacles. Throughout this chapter, I integrate other researchers’ treatments of the issue in attempt to stimulate debate and encourage a cautious policy approach. As will be argued, the implicit optimism of many researchers about access obstacles is to some extent unfounded. The matter of false optimism in regard to access problems is also taken up in parts of Chapter 6 where I address the optimism that often pertains to recent efforts to establish intermediaries to bridge the gap between farmers and futures markets.

**Farm size and output levels**

The first access-related assumption made in Chapter 2 and incorporated into Chapter 4’s analysis specified the precise quantity of coffee that farmers in each of the three countries grew each year. These quantities correspond to the amount of coffee specified in the coffee contracts offered by the futures exchanges upon which each farmer would respectively trade. If a farmer grows less than this amount, the hedging transaction
becomes partly speculative and serves to increase farmer price and income risk.\textsuperscript{69} If this risk is viewed as a substantial one by the farmer in question, small farm size will effectively exclude him from participating in futures markets.

As it turns out, large populations of farmers in the three countries do not grow enough to sell even a single futures contract. Put differently, in the general terms of the World Bank’s Commodity Risk Management Group (CRMG): “Attempts to market risk management products directly at smallholder farmers have not proven to be easy because … small production volumes do not equate to minimum lot sizes (CRMG 2005, 1).”

Just how problematic is farm size in the context of futures market access? The data presented below elaborates on the nature and significance of this obstacle in the three case countries.

\textit{Mexico}

The average size of a Mexican coffee farm is roughly 2.7 hectares (10,000 square meters = one hectare = about 2.47 acres). Yet, this disguises the fact that the majority of Mexican coffee farms are between 0 and 2 hectares in size—about 195,000 of the roughly 282,500 farms, or 69%. Large and very large farms, while representing a good deal of Mexican land planted to coffee, account for only a small proportion of total farms. Just under 2% of Mexican coffee farms are over 10 hectares in size (ITF, 2002; based on 1992 coffee census performed by the now-nonexistent Mexican Coffee Institute, INMECAFE).

\textsuperscript{69} If futures prices were declining with this sort of hedge in place, the farmer in question would reap a larger financial reward than is dictated by the size of her crop. If futures prices were rising, however, the farmer would end up paying for a quantity of coffee that she does not have and will not have in the future. Thus speculation can potentially raise farmer incomes or reduce them, depending on the prevailing trend in future prices.
Using average annual yield data for Mexican coffee for the years 1998-2002 from the FAO\textsuperscript{70}, the hypothetical Mexican farmer from the last chapter would have had to farm a plot of land roughly 39 to 40 hectares in size, in order to produce the 37,500 pounds of coffee required to sell one futures contract in NY. This represents a farm almost 15 times larger than the average. And, this means that less than one half of one percent (0.44\%) of Mexican coffee farmers grew enough coffee in the years of the coffee crisis to sell a single contract. It is not only small farmers but also medium sized and relatively large farmers who are excluded from futures trading by virtue of their production levels.

\textit{Brazil}

While Brazilian farms are among the largest coffee farms in the world, a substantial portion of Brazilian farmers are similarly excluded from futures trading for size reasons.\textsuperscript{71} The 1996 Brazilian Agricultural Census determined that Brazil’s 368,961 coffee farms average 4.91 hectares in size.\textsuperscript{72} About 71\% of coffee farms are less than 10 hectares in size; 25\% are between 10 and 50 hectares; and, 4\% are over 50 hectares (these

\textsuperscript{70} Please keep in mind that “average yields” are often higher than small farm yields. In Brazil for example, where average yields are the highest in the world, small farms are often relatively unproductive (see Watson and Anchinelli 2008). In many countries, this is not generally due to the size of the farm itself, but rather to the difficulties small farmers have in maintaining their farms and obtaining new production technologies and techniques.

\textsuperscript{71} Many discussions of Brazil’s coffee sector reference huge coffee estates, the fazendas, which are often thought to characterize the industry as whole. Topik and Samper caution against this conception: “Although certainly some of the fazendas that developed in São Paulo after the 1880s were among the largest export agro-industrial units in the world, other regions of Brazil had medium to small units. In neither Rio de Janeiro state, Minas Gerais, Espirito Santo, nor later Paraná was the large estate the rule. Over time the size of the Brazilian coffee estate steadily declined while productivity grew (in Topik et. al., eds. 2006, 124).”

are the *fazendas*, or large coffee estates, some of which are thousands of hectares in size).  

Using average annual yield data from the FAO from 1998-2002, the hypothetical Brazilian farmer from the previous chapter would have had to farm a plot of land almost exactly 7 hectares in size in order to produce the 6,000 kilograms (13,228 pounds) of coffee required to sell one future in São Paulo. While a more detailed breakdown of farms by size could not be found, these figures suggest that a substantial portion of Brazilian farmers, possibly the majority, are excluded from futures trading because they do not grow enough coffee.

**Uganda**

In Uganda the situation is very similar to that of Mexico due to the very small size of coffee farms. The Uganda Coffee Development Authority (UCDA) estimates that roughly 500,000 smallholders with plots between 0 and 2.5 hectares in size dominate the coffee sector, with only a very small number of large farms and estates. Baffes notes that average farm size is only 0.2 hectares (2006, 2). While an exact breakdown of farms by size could not be found, a recent study by several World Bank researchers on the impact of coffee price changes on Ugandan households gives the following breakdown for the household sample used in their survey (see Bussolo, et. al. 2006, 21). Farms of 0 to 1 acres (0 to 0.4 hectares) accounted for almost 23% of all farms; farms 1 to 2 acres (0.4 to 0.8 hectares) in size accounted for about 31%; farms of 2-3 acres (.8 to 1.2 hectares) accounted for almost 20% of the total, with farms of 3 to 5 acres (1.2 to 2 hectares)

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accounting for almost 16% of the total; farms of 5 to 10 acres (2 to 4 hectares) accounted for 8%, and only less than 3% of coffee farms were over 10 acres (4 hectares).

Based on average annual yield data from the FAO for 1999-2003, the hypothetical Ugandan farmer growing 5,000 kilograms (11,023 pounds) of coffee would have had to farm a plot of land between 7 and 8 hectares in size. This excludes virtually all Ugandan coffee farmers, at least 97%, from selling futures in London.

Summary and significance

Farm size and corresponding output levels thus appears to be one factor that prevents coffee farmers from accessing futures markets. In Mexico and Uganda the vast majority of coffee farmers, over 99% and 97% respectively, are excluded from accessing the markets individually for this reason. And, although Mexican farms are larger on average than those in Uganda, the larger lot sizes for the NY contract results in more farmers being excluded in Mexico than in Uganda. Even in Brazil, where coffee farms are some of the largest in the world, it is likely that a large portion of the farming population cannot sell a single future on the BM&F. This finding is all the more curious considering that designers of products sold on domestic/local exchanges (as opposed to the more global NY and London markets) have an opportunity to design contracts to meet the specific needs of domestic/local coffee market participants (see, e.g., Tsetsekos and Varangis 2000). That said, the degree of exclusion from the futures market in Brazil is significantly less than that in Mexico and Uganda because of the generally larger size and higher productivity of Brazilian farms.74

74 Dicum and Luttinger (1999) and Gresser and Tickell (2002) note that higher levels of “technification” in Brazilian production (including the application of pesticides and fertilizers), the ability to reap economies
Overall, the evidence suggests that futures markets currently serve only the very largest producers by virtue of the lot sizes specified in the various contracts. The markets are accessible only to a subsection of producers in each country, a very tiny subsection in the Mexican and Ugandan cases. The precise degree of exclusion by size varies in accordance with country-specific land-use patterns and yields, as well by the futures exchange in question. These findings for coffee confirm similar findings by Breger (2006) as to the inaccessibility of US corn and wheat futures markets for smaller American farmers. As will be seen below, this is not the only place where size is an advantage in accessing futures markets.

The matter of insufficient lot sizes has indeed been taken up by some agricultural development researchers (e.g. Rabobank 2004; ITF 2006; UNCTAD 2002; Lutten and Youssef 2007; Varangis, Larson and Anderson 2002). Yet, the manner in which concerns about lot sizes are discussed reveals a tendency to diminish the scope and scale of the problem. For example, the ITF notes the fact that “the minimum contract size traded on organized exchanges far exceeds their [“smallholders”] annual production quantity” (2006, 2). However, the Mexican and Ugandan cases illustrated that it is not only smallholders that are excluded on this basis—many medium-sized and large farmers are excluded as well. The ‘size problem’ is much more general than the ITF suggests.

As another example, Varangis, Larson and Anderson write: “The major challenge of ITF work is to find a local institution that can capably aggregate enough volume from many small farmers to access the international market for risk management instruments
Yield uncertainty

It was also assumed in the previous chapter that farmers enjoyed the luxury of constant yields, i.e. it was assumed that output was certain. Given certain output levels, hedging one’s entire crop is considered “optimal” (see, e.g., Newberry and Stiglitz 1981, 181). In reality, however, yield risks are on par with price risks in the threat they pose to farmers (see, for example, survey results presented in Chapter 3 that indicate the primary importance of weather risks for farmers in several coffee-producing countries). Further, a small but provocative body of economic literature illustrates how production uncertainty undermines the viability of hedging with futures. Below I discuss the nature and significance of yield uncertainty in each of the three case countries.
Beginning with Mexico, annual yield data from the FAO illustrates the extent of yield variations across crop seasons. A graphical representation of average Mexican yields from 1961-2006 appears below (these are all the years for which data is available from the FAO).

Average annual yields in Mexico vary over the 1961-2006 period from a peak of almost 750 kilograms per hectare in 1990 to a trough of about 377 kilograms per hectare in 2005 and 2006. The coefficient of variation of average yields over the 1961-2006 period is roughly 15%. During the years for which hedging calculations were performed in the previous chapter, 1998-2002 for Mexico, yields varied considerably. Average yields for 2000 were over 15% higher than those for 1999, after having risen slightly from 1998 to 1999; 2000’s yields were about 16% higher than 2001’s; and, 2001’s yields were roughly 7% lower than 2002’s. While still substantial, the magnitude of the variations in Mexico are not nearly as large as they are in Brazil, Uganda, and many other producing countries. This led researchers at the ITF to note that “it can be concluded that apart from the risk of frost in Puebla [more below], the rest of coffee production has had relatively low production risk (2002, 12).”
Annual yields vary seasonally in Mexico for several reasons. First, and as is also the case in Brazil, Arabica coffee trees produce on a biennial cycle, with every other year producing a relatively larger crop. While a somewhat predictable phenomenon, the precise size of the on-year and off-year crops vary due to weather, climate and other growing conditions. To the extent that the biennial cycle is predictable, this confers more certainty about the nature and extent of yield variations to producers of Arabica coffees than those of Robusta coffees (the variations in which are due to more irregular phenomena).

The weather, of course, is a further source of yield variations. According to the ITF, which consulted with Mexico’s leading provider of crop insurance, the most frequently problematic weather-related risks are frost (especially in the state of Puebla), excess humidity and high winds (2002, 11-12). Excess humidity, including floods, are most problematic in the state of Nayarit.

Pests and diseases including the coffee berry borer (a pest) and leaf rust (a fungus) are also problematic. Very interestingly, the ITF comments that during times of low prices, as during the most recent coffee crisis, smaller, poorer Mexican farmers tend to self-insure by reducing their use of pesticides and fungicides (i.e. capital rationing; ITF 2002). Yet, reducing such inputs lowers yields, exposing farmers to additional yield risk. The ITF estimates that farmers can lose up to 50% of their yields by using “low input/low yield production technologies” (2002, 14). As noted in the previous chapter, many hedging advocates hope that the intra-seasonal income stability afforded by hedging will enable farmers to make decisions about inputs with more certainty and raise productivity.
That said, the matter of pests, diseases and yield variations is one of the many interesting places where this discussion of futures markets intersects with the twin issues of environmental degradation and public health. Dicum and Luttinger report that, “Per acre, coffee is the third most pesticide-doused crop in the world, after cotton and tobacco—and the leading pesticide-intensive crop of any kind that we eat or drink (1999, 54).” They go on to note that many of the pesticides used by coffee farmers, including DDT and benzene hexachloride, are banned in the US because they are carcinogens and/or because environmental levels are already too high. In this case, the potential for hedging to reduce uncertainties surrounding pesticide applications (and thus allow for more stable and higher short-term yields) potentially comes into conflict with environmental sustainability, public health goals and long-term farm sustainability (chemical build-up has been shown to deplete soils in the long-run). Put differently, that hedging may encourage farmers to use harsh chemical fertilizers and pesticides by stabilizing or raising incomes may not be a good thing from the perspective of environmental sustainability. In Chapter 6 I discuss several ideas for linking hedging with futures to environmental preservation efforts.

**Brazil**

Moving on to Brazil, annual yield data from the FAO illustrates the extent of yield variations across crop seasons. A graphical representation of average annual yield variations for coffee in Brazil, from 1961-2006, appears below.
In Brazil, average annual yields moved from a peak of almost 1120 kilograms per hectare in 2002, to a trough of under 300 kilograms per hectare in 1964. For this 1961-2006 period, the coefficient of variation of average annual yields is over 32%. During the years for which hedging calculations were performed in the previous chapter, 1998-2002 for Brazil, yields varied substantially from year to year. From 1998 to 1999, yields fell by over 10%. Yields rose by almost 15% from 1999 to 2000, fell by over 7% from 2000 to 2001, and rose by about 43% from 2001 to 2002 (2002 was unsurprisingly when world coffee prices hit rock bottom). As with Mexico, that Arabica coffee trees produce on a biennial cycle is responsible for a good part of this variation. In fact, the on-year/off-year oscillations are much more visible in Brazil’s average yield figures than they are in Mexico’s.

Also problematic in Brazil, as in Mexico and virtually all other coffee-producing countries, is the weather. In particular, frosts roughly (although not predictably) every five years severely curtail production—Brazilian frosts are notorious in coffee circles. It was one such frost in the mid-1990s that led to record-high world coffee prices, highs from which prices plummeted as the coffee crisis began later in the decade. As in
Mexico, pests (like the coffee leaf miner) and diseases (like leaf rust) also impact average annual yields in Brazil.

Uganda

Last, the Ugandan case similarly illustrates the problem of yield uncertainty. Evidence on annual yields from the FAO (expressed in kilograms of coffee harvested per hectare) shows the extent of yield variations across crop seasons. A graphical representation of average annual yield variations for coffee in Brazil, from 1961-2006, appears below.

Similar to the Brazilian case, Ugandan yields were at their lowest during the era of government-managed coffee markets, reaching a trough over the 1961-2006 era of about 384 kilograms per hectare in 1961. Over this same period, average annual yields peaked at almost 1030 kilograms per hectare in 1996. For the 1961-2006 period the coefficient of variation of average annual yields is over 23%. Over the years for which the hedging calculations of the last chapter were performed, 1999-2003 for Uganda, yields varied most dramatically of all the three cases. From 1999 to 2000, yields dropped by almost 50%. Average yields rose by over 55% from 2000 to 2001, rose by almost 29% from 2001 to 2002, only to fall by roughly 40% from 2002 to 2003.
While Robusta coffee trees produce more consistently from year to year (there is no biennial cycle), there are a variety of other factors that contribute to yield uncertainty in Uganda. Coffee wilt disease has perhaps had the most pronounced effect on yields over the past decade. Masiga et. al. report that, “The impact of the coffee wilt disease is enormous. UCDA estimated a loss equivalent to 61,200 tonnes (1.02 million bags) of coffee, which is around 40 per cent of the output in recent years (2007, 16).” You and Bolwig note that over 15 million coffee trees have been destroyed over the past decade by the disease (2003, 6-7). Effecting mainly Robusta plants, the disease is caused by a fungus and has spread rapidly around Africa since the 1990s. The authors additionally note that droughts, relatively common in Equatorial Africa, are not adequately addressed as irrigation systems are unaffordable for many farmers (You and Bolwig 2003, 6-7).

Jack Birgiwa, Chairman of the National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE) in Uganda, adds some additional reasons for yield variability (Birgiwa 2005). He notes that high input prices have resulted in reductions in the applications of fertilizers and pesticides (like in Mexico), which serve to reduce yields and exacerbate the impact of diseases like coffee wilt. Additionally, Birgiwa suggests that declining availability of agricultural extension services since the collapse of Uganda’s marketing board in the early 1990s has deprived farmers of technical assistance to increase productivity. Last, government replanting programs have yet to reach many farmers whose trees are ageing or dying.

It should also be noted that, for all coffee producers, asymmetric supply responses combined with the biology of coffee plants can also introduce uncertainty into yields. Recall from Chapter 3 that coffee farmers often will plant new trees in response to high
prices, but not take trees out during times of low prices (rather they will simply not invest in the trees’ upkeep and not replace dead trees). Further recall that coffee trees take anywhere from 3-5 years to produce a full crop. New plantings during times of high prices, then, can lead to much larger yields from 3-5 years after planting. Brazil’s uncharacteristically high yields during the 2002 crop season may be at least partially attributed to all of the new coffee trees planted in 1997-98, while prices were very high and right before the crisis began.\textsuperscript{75}

\textit{Summary and significance}

While the nature and extent of output uncertainty differs across the three cases, in all of them it undermines the viability of hedging with futures. Yield uncertainty can result in under-hedging, i.e. hedging a quantity of output less than actual output, and leave producers exposed to sometimes considerable price risk on the un-hedged quantity. Such uncertainty can also result in over-hedging, i.e. hedging a quantity more than actual output, turning a hedging transaction into a partly speculative one. Such considerations have generated a small but suggestive literature on the influence of quantity uncertainty on the viability of hedging with futures. This literature suggests that in general quantity uncertainty can seriously, if not completely, undermine the income security benefits of hedging.

Most models of optimal futures hedging begin with the presumption, as I did in the previous chapter, that yield uncertainty is nonexistent (see, e.g., Newberry and Stiglitz 1981, Peck 1975). Under these conditions producers can hedge their entire expected output which is simply the same as the prior year’s output. However, “under production

\textsuperscript{75} Agricultural economists frequently refer to this phenomenon as a “cobweb” cycle.
uncertainty, the optimal hedge in general is less than expected output when output and price are independent…” (Lapan and Moschini 1994, 465, emphasis added). In a liberalized market setting output and prices are indeed independent for any single producer—farmers no longer enjoy the “natural hedge” that existed when national economies were relatively closed, whereby prices adjusted to balance yield changes such that revenues remained relatively constant (farmers in the same country usually experience similar conditions that impact yields, like the weather).

So, how much of her output should a farmer hedge if it is uncertain? Lapan and Moschini argue that, under such circumstances, “it may not be possible to establish useful general hedging results (1994, 465).” While these scholars do try to formulate just this sort of one-size-fits-all solution to the problem, they do so by assuming a “constant absolute risk aversion” (CARA) on the part of the producer. Not only does CARA assume that farmers’ preferences stay constant over time and in response to changing conditions and opportunities, but it also assumes that farmers are 100% risk averse. In fact, Rolfo dismisses such assumptions at the outset of his analysis on the grounds that, “these preference structures have been criticized as unrealistic” (1980, 103). Although small, poor farmers tend to be relatively risk averse, UNCTAD notes that, “Within the group of farmers and even within each sub-group, there are significant differences in the degree of risk aversion (2002, 6).” The general strategy that Lapan and Moschini arrive at thus seems inapplicable to the situation of most coffee farmers, many of whom are likely risk-averse but not absolutely or constantly so.

Rolfo is even more pessimistic. He writes: “The major result of the analysis is that, in this environment, a minimal usage of a futures market (or none at all) may be superior
to a full short hedge (1980, 101).” Rolfo goes so far as to argue that low farmer usage of futures markets, relative to merchants (for example) might actually be explained with reference to yield uncertainty: “While the merchant can regulate the size of his inventory, the farmer cannot accurately forecast the size of his harvest even after all production decisions have been made (1980, 101).”

It thus appears that yield uncertainty poses a different sort of problem than did size in the previous section. First, variations in yields may result in farmers having only intermittent access to futures markets. While one year they may grow enough to sell a single contract, the next year yields may fall such that the farmer does not grow enough to do so. This would be the case if a farmer knew in advance that yields were going to fall from one year to the next (perhaps Mexican and Brazilian Arabica farmers who anticipate on- and off-year yield variations; but even the magnitude of these variations are not easily predicted if they can be at all).

But, as is more likely, the farmer is uncertain about the upcoming season’s yields. This is likely in all three case countries, but perhaps most so in Uganda where annual output variations are large and the contributing factors to varying yields are numerous. Hedging on the basis of the prior year’s output level, or on expected future output levels, can introduce more risk for the farmer. Under such conditions, Rolfo concludes that not hedging at all may be the best strategy. In other words, yield uncertainty may eliminate completely the supposed income benefits of hedging for farmers. This suggests that while yield uncertainty may not keep a farmer from trading in futures markets, it might reduce or eliminate whatever risk-reductions could result from doing so. In this manner, the issue of yield uncertainty presents itself as both a problem for access and a problem
with the *quality* of the income security services offered by futures hedging. In terms of access, yield uncertainty can mean that farmers grow too little to sell one contract (as with farm size and output levels above). In terms of quality, yield uncertainty can turn a hedging transaction into a speculative one, introducing rather than reducing risk and potentially costing the farmer dearly.

Second, the issue of farmer *choices* again comes to the forefront. If one takes CARA to be unrealistic, then Lapan and Moschini’s inference that “it may not be possible to establish useful general hedging results” implies that each coffee farmer will need to decide for himself how much of his output to hedge. The decision-rule, if one can be found, will likely vary from farmer to farmer and over time as circumstances change. In this manner, the income security gains from hedging are again revealed to be highly individually choice-dependent, as was also shown to be the case in different ways in the previous chapter.

**The cost of futures trading**

In Chapter 4’s discussion I further assumed that coffee producers in Mexico, Brazil and Uganda could afford to make the necessary margin calls (this is why the hedge could be continued after months of negative income), were faced with no transaction costs, and could find a broker willing to deal in small transaction volumes. These three assumptions relating to cost and affordability are highly problematic in practice and constitute additional access obstacles. Each is addressed in turn below.

**Margin requirements**

Beginning with margin requirements, each of the three exchanges stipulate an initial margin that must be deposited prior to the commencement of trading. This represents
one of the largest, if not the largest, up-front cost for producers looking to hedge on futures exchanges. On ICE the initial margin for hedgers using the coffee “C” contract is US$2500 per contract bought or sold. On LIFFE, the initial margin for hedgers using the Robusta coffee contract is USD$1250 per contract bought or sold. On the BM&F the initial margin is determined formulaically on the basis of individual risk exposures and contract specifics, but the exchange notes that the maximum margin for short hedgers falls between roughly $1645-$1792 reals (or roughly USD$650-USD$720).

The income significance of margin requirements varies across the three cases. In Mexico, posting the margin for one contract represents over 7% of coffee income earned the first year of the crisis for the hypothetical farmer in the previous chapter. In Brazil, the margin required to trade one contract eats up over 6% of the hypothetical coffee income from the first year. In Uganda, the one-contract margin requirement constitutes over 24% of coffee income earned the first year of the crisis by the hypothetical farmer. Margin requirements are burdensome to producers in all three cases, but most so for Ugandan producers trading futures on LIFFE and least so for Brazilian producers trading on their own domestic exchange. In absolute terms, however, the margin requirement is most burdensome for Mexican producers who must ante up almost two times the margin required of either Ugandan or Brazilian producers.

It bears mentioning as well that these margin requirements effectively prohibit trading altogether for farmers of average size in Mexico and Uganda. In Mexico, where the average farmer’s income is only about 6% of that of the hypothetical farmer, the

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margin requirement is larger than total income from coffee sales from the first year of the

crisis. This is also the case in Uganda, where the average farmer earns about 3% of the
total income earned by the hypothetical farmer. In Brazil, where the average farmer
makes about 70% of the income of the hypothetical farmer, the margin requirement
represents just over 10% of the income from coffee during the first year of the crisis. It
seems as if the Brazilian exchange has more effectively tailored its margin requirements
to the financial position of resident coffee farmers than it has tailored its contract
specifications as to lot size to the size of the average coffee farm (see section above on
farm size for more information on lot sizes specified in the Brazilian contract).

Further, the benefits of rollover hedging discussed previously are tempered by the
large financial outlay required to initiate such a trading scheme. Gardner’s statement
about three year rollover strategies for corn, soy and cotton suggests a similar conclusion:
“Thus, average transactions costs will be three times as high for the rollover approach
unless there are economies of size in brokerage fees or margin costs… (1989, 313).” My
research, as reported in Chapter 4, has shown no economies of scale in margin
requirements for the coffee contracts at any of the three exchanges under consideration.
This means that for a four year rollover hedge (like Rollover #2, which involved selling 4
contracts the first year) the margin required is 4 times that required for one contract: 28%,
24% and 96% of coffee income from the first year of the crisis for the hypothetical
farmer in Mexico, Brazil and Uganda, respectively. Absent extensions of credit or
subsidies of some sort, a rollover hedge is thus certainly a financial impossibility for the
average Mexican and Ugandan farmer, and represents a financial hardship even for the
average Brazilian producer.
Though rollovers may be more costly, it remains that the initial margin required even for the sale of one contract represents a serious financial challenge for many producers. Crucial is the fact that margin deposits are required when the hedge is begun (at the beginning of the crop season or at the very least before the harvest begins). As it stands producers are already faced with other financial outlays at this point in the season such as labor, pesticide, and other input costs. Further, input costs are frequently financed by producers via lines of short-term, pre-harvest credit begging the question as to whether margin requirements would also require financing.

The New York Times recently reported that even US farmers, who tend to be wealthier than their developing country counterparts, worry about financing initial margins as well as later margin calls. One farmer interviewed had to “rely on his bank to advance him the margin he needs to keep those hedges in place — a worrisome requirement even for a successful farmer… (Henriques 4/22/2008, 2).” Tiffen and Fernandez, writing for World Bank’s CRMG, note that in El Salvador a “dedicated line of credit” has been set aside for farmers in order to satisfy initial margin requirements and subsequent margin calls (2005, 5). As will be discussed below, there has been talk of extending credit to Mexican farmers for this same purpose in the future.

The likelihood that some producers would have to go into debt to finance margins is troubling. Shiva (2004) notes that farmers across a spectrum of crops are increasingly exposed to lower commodity prices and higher input prices, which combine to increase the reliance of producers upon debt to sustain their operations. The author notes that in India high levels of indebtedness have been indicated as the cause of tens of thousands of farmer suicides across the country over the past several years. This might reasonably lead
one to question an income security arrangement that necessitates significant levels of farmer debt to facilitate participation. This is especially so in the case of small Mexican and Ugandan farmers where the size of the loan that would be required to finance the margin for even one contract can be well above annual coffee income which generates concerns about the possibility of farmer default.

Exchange, clearing and brokerage fees

Continuing on, exchange, clearing and brokerage fees are also levied on futures market participants. Depending on the specific mode of the trade (e.g. floor traded, electronically traded), exchange and clearing fees (levied by the derivatives exchanges and their associated clearinghouses) range from USD$0.40-USD$1.75 per trade on ICE. On LIFFE, the fees are roughly USD$1.25-USD$1.50 per contract. On the BM&F the fees amount to roughly USD$0.65 per contract. These fees, given their marginal size, do not appear prohibitively costly and thus do not appear as an impediment to futures trading even for small farmers. Mohan’s (2007) study of the costs of options hedging for coffee farmers similarly found that these transaction costs were relatively low.

Brokerage fees, however, vary more widely. A brief survey of leading brokerage firms that advertise on the Internet revealed that brokerage fees range from USD$0.99 to USD$14.50 per trade, per side (i.e. long or short). The BM&F notes that the minimum commission per contract runs between USD$2.68 and USD$ 4.28 per contract, and that brokerage houses can establish rates above and beyond this should they choose.

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77 This was the range I determined by ascertaining the brokerage fees for E-trade, Clear Trade and Interactive Brokers.

should also be noted that these are the fees levied on “self-directed” accounts where the client trades with virtually no assistance from his broker. Traders that require assistance, perhaps in strategizing and information gathering and assessment, face larger fees. Clear Trade, which offers brokerage services for the NY and London markets, charges a minimum of USD$7.95 per trade per side for self-directed commodity futures accounts, but charges a minimum of USD$22.50 per trade per side for “broker-assisted” accounts.  

Such practices, common across all of the brokerage firms I researched, builds into futures trading a financial penalty for those who require the assistance and expertise of a broker—members of this group likely come from segments of the coffee farming community with less formal education, poorer access to the Internet and rural extension services, and less experience using futures in the past. Arguably, this means that those portions of the farming community that are already at a disadvantage in terms of education, infrastructure, and technical assistance are additionally disadvantaged by brokerage fee schedules. Further, these are precisely the farmers that are likely to have the lowest incomes and the smallest farms. Again, as in the case of farm size and contract specifications, a distinct advantage to being big in futures markets can be ascertained.

This is not the only place where transaction costs are different for different sorts of farmers. Many brokerage firms, like Clear Trade and Interactive Brokers, require a minimum account balance of USD$10,000 to begin trading. While initial margins are deducted from this deposit, this is little consolation to farmers for whom posting the initial margin is already difficult. Not only do such requirements impede access to

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brokerage services for many farmers (and not just poor farmers as this is a substantial sum even for many larger, commercial farms), but they also exhibit economies of scale. The minimum balance is the same for small farmers trading only one contract as it is for larger farmers trading in multiple contracts.

_Broker transaction costs_

The transaction costs incurred by brokers themselves in opening trading accounts for developing country coffee farmers also appear to impede access. Recall from the previous chapter that I assumed that the producers in question were able to find a broker willing to deal in small (one contract) transaction volumes. It would appear that such an assumption is quite unrealistic.

For example, Dodd notes that: “Private enterprises face certain fixed costs of dealing with any one customer, and they also face increasing costs when the transactions are cross-border and involve less developed local financial markets. For instance, futures commission merchants in the U.S. (futures and options brokers) would find it very expensive to transact with customers in rural Africa, and alternatively farmers in rural Africa would find it daunting to establish accounts in the U.S. through which to trade with U.S. brokers (Dodd 2007, 25-6).”

The CRMG made a similar finding: “The rigorous nature of know-your-client requirements and increasingly stringent anti-money laundering initiatives require a process of due diligence, particularly for unknown clients in developing countries. Although providers view the background work and relationship with the World Bank’s CRMG as a valuable addition to the due diligence process, they continue to require a lengthy list of background documentation before opening accounts to trade (CRMG
2005, 1).” The Group later notes that such bureaucratic requirements and the costs entailed therein are an impediment to access to futures markets for small farmers.

In this context too futures markets appear to confer an advantage upon larger farmers, in this case because economies of scale in transaction costs for brokers result in a preference for clients that trade larger numbers of contracts. Though, this seems much more problematic in the Mexican and Ugandan cases as trading by coffee farmers in these countries involve cross-border transactions. In Brazil, transaction costs and due diligence requirements are likely somewhat less burdensome because all transactions are domestic.

**Summary and significance**

To sum up, the costs of futures trading have been shown to be an obstacle to futures market access, especially for smaller and poorer farmers who are who excluded from futures trading due to difficulties in meeting margin and minimum brokerage account balance requirements. This is most so for Mexican and Ugandan farmers and less so for Brazilian farmers who tend to have larger farms, higher yields and thus also higher incomes. Smaller farm size is also disadvantageous in the context of economies of scale in brokerage account minimums. Further, brokerage fees are higher for individuals who need assistance from their brokers in making trades, and those most likely to require assistance are arguably least able to afford it.

Please note that futures markets are beginning to appear most exclusionary of farmers with a particular constellation of traits and characteristics: small to medium sized farms; lower-income; and, those needing assistance gathering and using information. As will be discussed later on, although they are least likely to access to futures markets it is
precisely farmers with these sorts of characteristics that need price risk management most.

Information availability and cost, and futures market knowledge

Two of the access-related assumptions made in the last chapter speak to two closely related obstacles to effective futures trading in the three case countries: information availability and cost, and the capability to use said information to effectively trade in futures (what I am calling “knowledge” and “skills”). I would like to note that, of all of the access issues discussed so far, information and knowledge are the most difficult to systematically quantify. To the extent that data were available and quantification possible, I attempt to provide quantitative evidence to this effect. That said, some of what appears below is anecdotal evidence about the manner in which information and knowledge issues pose obstacles to access and effective use of futures markets. Taken together, this evidence suggests that in all three case countries, but most so in Uganda, information availability and affordability as well as gaps in “technical capacity” pose potentially serious obstacles to effective futures trading. Below, information is address first, followed by knowledge/skills.

Information

Beginning with information obstacles to effective futures trading, Mohan notes in a recent article that, “making reasonable decisions based on fine-tuned hedging instruments (futures and options) requires permanent access to information and processing of the various data (2007, 347).” Gibbon agrees that “users need to be in daily contact with financial markets in order to use them optimally” (2005, 16). The references here to “permanent access” and “daily contact” suggest both the significance of market
information for farmers as well as the scale and intensity of the information-gathering effort.

At the same time, acquiring the necessary information to trade in futures is exceptionally difficult for many coffee producers, especially those with little access to information and communications technologies (ICT) and lower incomes. Indeed, these two factors—availability and affordability—are linked, with income levels often determining an individual’s ability to acquire and use ICT technologies. National income is also an important determinant of levels of infrastructure development. This is the general message of Roberts’ (2008) statistical report on global ICT for the United Nations. Across all countries that were part of the study (a fairly broad global contingent), use of ICT of virtually all types is on the rise. That said, across the developed world ICT usage is highest, and usage declines as country incomes decline, with the “least developed” countries using ICT less than any other category of country.

Confirming this broad global trend in the agricultural context and also making the explicit link between farm size and information access, UNCTAD notes that: “Small farmers in developing countries often suffer from lack of information on market conditions at different locations or different points in the marketing chain (UNCTAD 2004, 4-5).” Potts discusses this same general problem in the coffee context: “Producers, policy makers, roasters and even consumers are constantly faced with asymmetric information on the actions of other players within the coffee market… [there is a] persistent context of imperfect information within the coffee sector... (2003, 3, emphasis added). Taken together these comments again suggest that it is smaller coffee farmers who are most disadvantaged in terms of futures market access.
Please keep in mind that these authors are discussing problems for producers in obtaining information about the *coffee market*. That producers also need information about the futures market only adds an additional layer of difficulty to the informational task that confronts them. Fafchamps and Hill’s 2006 study on price risk management in Uganda suggests that potential hedgers lack even the most basic information about futures—indeed, many had not even considered hedging because they did not know that futures and options instruments existed at all.

Further, information costs exhibit considerable economies of scale. The information required to effectively trade one futures contract is the same as that required to trade 10 or 100 contracts. A bias towards larger farmers trading in multiple contracts can thus be seen in this context as well (recall that this was also one conclusion of the previous section’s discussion of transaction costs).

Below I discuss in more detail the information constraints facing coffee farmers in the three case countries. I discuss the vehicles available for information gathering in the three countries first, and then move on to discuss recent efforts to expand information availability and the informational benefits of having a domestic futures exchange.

*Vehicles for information gathering*

A variety of avenues for information gathering are theoretically open to producers, including: Internet and computer technologies (this is how I obtained all of the information that I needed); television; radio; cellular phones; market information systems; rural extension services; local commodity exchanges; and futures brokerage services. Two researchers recently noted, however, that: “In part due to high illiteracy rates, rural radio and television programs are two of the most important mechanisms for
farmers [“in the rural areas of developing countries”] to obtain information about agricultural markets (Gonzalez-Rivera and Helfand 2001, 11).” In practice, then, there are significantly fewer options for most rural producers in the developing world.

Data on ICT usage from the United Nations confirms this general trend in the three case countries. In Brazil and Mexico, both considered to be upper-middle income developing countries, ICT usage is higher and involves more sophisticated technologies than in Uganda, considered to be among the world’s lowest-income developing countries. That said, usage rates and degree of technological sophistication in all three countries do not portend well for coffee farmers looking to amass sufficient information to effectively trade in futures. Indeed, as mentioned above, existing infrastructure and ICT access is insufficient to provide many coffee producers even with basic price information from the coffee market itself.

In Brazil roughly 17% of the population uses the Internet; about 11% have a personal computer; 22% have a television; 43% have a radio; and about 46% subscribe to cellular mobile phone service. In Mexico the figures are almost identical to those in Brazil: about 17% of the population uses the Internet; about 11% have a personal computer; 27% have a television; 33% have a radio; and about 44% subscribe to cellular mobile phone service. The comparison to Uganda is rather dramatic: under 2% of Uganda’s population use the Internet; 0.5% have a personal computer; 0.15% have a television; 12% have a radio; and, fewer than 5% subscribe to cellular mobile phone service. Please keep in mind that ICT usage rates tend to be skewed towards urban populations, with rural communities being significantly less connected than urban ones. For example, Watson and Anchinelli (2008) note that for many small coffee farming communities in Brazil, electricity and
roads are virtually nonexistent, let alone more sophisticated communications and information infrastructure.

On the surface, these figures suggest that in all three case countries, radio and mobile phone are the informational vehicles most likely to penetrate coffee farming communities. That said, the size of the population potentially reached by these means varies dramatically between Mexico and Brazil on the one hand and Uganda on the other. It also bears mentioning that my own experience with devising hedging strategies in the last chapter suggests the need not only for information, but the computing power to organize it. Absent a program like Microsoft Excel and a computer on which to run it, the task of recording and collating future price information would be exceptionally daunting and time-intensive, though not impossible.

**Recent efforts to address information obstacles facing agricultural communities:**

**MIS and AES**

The information problems that exist for rural farming communities in the developing world have not gone unnoticed by international development institutions. Over the past several years there has been a push to develop both international and national “market information systems” (MIS) in order to even out the information asymmetries that generally plague developing country agriculture.

For example, UNCTAD has developed two different systems: INFOCOMM and INFOSHARE. The former is an “electronic portal” that “provides up-to-date market information in three languages—English, French and Spanish—on factors influencing commodity markets (UNCTAD 2005, 2).” INFOSHARE is a “flexible database system for gathering and sharing information on commodity prices”, and also might have data on
“intermediate costs” like those of transport and storage (UNCTAD 2005, 2).” The FAO’s database, FAOSTAT, provides similar information, including data on yields and prices in different countries and across a variety of crops. However, all three of these international sources provide information only on the cash market. Furthermore, these databases are “electronic”, making them inaccessible for those without Internet and computer access. 80

The governments of Brazil and Uganda also operate national level MIS. The Government of Brazil operates the “Agricultural Market Information System” (SIMA) that conducts daily Internet-based surveys on producer prices and also disseminates that information to interested parties. 81 My sense is that dissemination is far from systematic, particularly considering that the only mention of the service was on a government webpage.

The Uganda Coffee Development Authority (UCDA) reports that it has recently developed an MIS to disseminate national and international price information. “The system relies on existing network of field staff collecting domestic market information and on the current international information sources. The dissemination channels instituted include free newspaper/radio publication of price information; use of the designated warehouse operators as information channels; and text messages via mobile phones (which does not entail any cost but rather offers a share of revenue from paying users).” 82

Although the system is new, there is already some indication that market information will

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80 Some researchers (e.g. Rutten and Youssef 2007) place a lot of stock in ongoing efforts in India to link rural farming communities to the Internet. An experimental program has recently set up “e-choupals”, or Internet kiosks, in several remote villages. The e-choupals have proven very successful in allowing farmers access to market information, technical advice, and other resources. That said, the program is currently very limited in scope.


not reach all producers. Masiga and colleagues report that: “Although, there has been an increase in market information flow through mobile phones, radios … a large segment of the population does not have access to these (2007, 17).” Encouraging, however, is the fact that the UCDA’s MIS relies upon those ICT technologies most widely used in Uganda, radio and mobile cellular phones. It is also worth mentioning, again, that this MIS transmits cash price information, and not futures market information.

Part of the motivation to construct MIS is found in the decline of agricultural extension services (AES) across the developing world. AES were a primary source of market information and technical assistance for many producers until liberalization efforts began in the late 1980s and early 1990s. Efforts to balance and curtail national budgets (particularly after the 1980s debt crises and the mounting liabilities associated with price stabilization funds) included cuts in funding for AES. UNCTAD notes that the private sector was expected to fill this informational and technical assistance gap, but that “in most cases the private sector has proved unable to do so for a variety of reasons, including that national markets are often too small or insufficiently organized for private sector service providers to realize economies of scale (UNCTAD 2006, 8).”

These difficulties with private AES are evident in the three case countries under consideration here. The FAO notes that in Mexico in the late 1980s centralized public provision of AES was dismantled in favor of a fee-based system targeted to the needs of mostly larger farmers. Since that time, the responsibility for AES has devolved from the federal to state level (Rivera 2001, 26). In Brazil each individual state also provides for its own AES (Rivera 2001, 23), and several researchers have recently lamented the
overall decline in funding for and quality of AES in Brazil. Decentralization and privatization is also in the works in Uganda where various development organizations have been “assisting Uganda to plan shifting administrative and fiscal authority for extension to local government and farmers’ groups” (Rivera 2001, 28).

The FAO notes elsewhere that in general, “Although decentralization is good in principle, the initial stage shows quite a bit of setback for extension (Qamar 2005, 13).” Among the problems with decentralized AES are interference in technical matters by local politicians and officials, budgetary problems (associated with the lack of priority placed on AES in many localities), and “institutional chaos” because “the central government did not adequately prepare itself or the local governments in advance before embarking on decentralization” (Qamar 2005, 13-15).” In Uganda, Qamar notes that “some district authorities have preferred to spend the extension budget on constructing feeder roads, leaving extension staff without salary for several months (2005, 15).”

While anecdotal, such evidence does generate concern about the ability of AES in the three countries to systematically and consistently provide high quality, costly information to coffee producers, especially small ones. That said, the institutional framework required to do so is largely in place in the three case countries; political priorities, information dissemination and funding appear as the major obstacles.

Domestic futures exchanges

Continuing on, the existence of a domestic futures exchange may allow for easier information gathering for traders in that country. Mohan argues, “The price discovery information in a local exchange will be more transparent to producers and local traders.

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They can access historical information with no restrictions… (Mohan 2007, 348-9).”
UNCTAD agrees: “In many parts of the developing world, a new breed of commodity exchanges are proactively expanding market access – both to the exchange markets but also crucially to the exchange’s pricing information (UNCTAD 2006, 15).”

While Mexico does have a domestic exchange, it does not offer coffee contracts (although for producers of other crops, the existence of the local exchange may make information easier to obtain). Of the three country cases, then, Brazilian coffee farmers may face fewer impediments to gaining futures market information given the existence of a local exchange. While the information provided by the BM&F is free of charge, my own experience suggests that Internet capabilities are vital for access to them.

**Knowledge**

The capability to effectively use information once it is gathered, and the correlate capability to devise hedging strategies and make the myriad decisions involved in effective trading presents the final obstacle to futures trading discussed here. While information accessibility is problematic for a variety of reasons discussed above, knowledge gaps appear to be a qualitatively different problem. I use ‘knowledge’ here to mean those skills, capacities, aptitudes and technical capabilities required to make good use of derivatives markets.

Some scholars discuss such knowledge-related capabilities in terms of varying degrees of “financial sophistication” or “financial literacy” (see, e.g. Francis 2004; Froud, et. al., in Assassi, et. al, eds. 2006). However, I think this phrase confuses the matter if only because there are many financially sophisticated and literate individuals who nonetheless find it difficult to understand derivatives, let alone make good use of them.
Tickell (1999) implies that as far as financial sophistication is concerned derivative instruments are in a class of their own—he notes that in some high-profile financial firms there is only one person who understands how the firm’s assets have been leveraged with derivatives. The untimely death of this one person, Tickell writes, has thrown firm operations into turmoil as there is no one left who understands the complexity of the instruments and how they are used.

Indeed, the terms “quantum finance” and “nuclear financial engineering”, invoked to describe the work of those entrenched in this growing corner of finance, are another testament to their opacity and frustrating complexity for potential users. Figlewski argues, “[T]he large derivatives losses experienced by major financial institutions in recent years suggest that even sophisticated investors are capable of making big mistakes about derivatives (1997).” For example, both recipients of the 1997 Nobel Prize in Economics, Myron Scholes and Robert Merton, who, along with Fischer Black (who died in 1995), developed the Black-Scholes options pricing formula, went on to form a derivatives-trading hedge fund—a fund called Long Term Capital Management (LTCM). LTCM found itself in serious derivatives-related financial trouble in 1994 and was ultimately bailed out by the United States Government. Thus two Nobel Prize winners—the men who figured out how to price an option by drawing on the differential equation for heat diffusion employed in physics—were not able to avoid large derivatives losses. Few would argue that Myron Scholes and Robert Merton are not financially literate or sophisticated—again, derivatives are perhaps in a class of their own.

The World Bank’s ITF and CRMG consistently regard “technical capacity” as one of the largest obstacles to effective derivatives trading in the developing country agricultural
context. The ITF reports that “lack of knowledge of such market-based price insurance instruments” and “lack of understanding of how to use the tools available” are among the foremost obstacles for accessing derivatives markets for small farmers in particular (ITF, 2006a: 2). The CRMG writes that, “Training by the CRMG at the farmer and even the cooperative level has proven to be a lengthy exercise and may not be the most efficient way to build capacity (2005, 3).”

In the Mexican coffee context, the ITF has found that “there is a need for specific training and technical assistance” (2002, 4). The need for technical assistance in Mexico is compounded by the socio-economic characteristics of residents of Chiapas, Veracruz, Puebla and Oaxaca, states that collectively account for the majority of Mexican coffee production: “The majority of Mexico’s illiterate and poorly educated adults can be found in the states of Chiapas, Oaxaca, Guerrero, Hidalgo, Veracruz, Puebla, and Michoacan. Children in these states leave school out of economic necessity to support their families (Kuznetsov and Dahlman 2008, 79).”

Similarly, working in the coffee and cotton sectors in Uganda, the CRMG recognizes the “high needs for capacity” (2005, 11-12 work summary piece). In Uganda where 70% of the population works in agriculture (over 40% of whom live in poverty), illiteracy and low educational levels are the norm particularly among women and girls (UNDP 2007, 54-6).

In Brazil as well, a recent World Bank study highlighted the needs for education in financial matters: “The importance of socioeconomic characteristics such as education, in determining access suggest that programs of financial education, financial mentoring, training and twinning and awareness building may also be important for raising financial
access (Kumar 2005, 2).” Brazil’s rural population tends to be disproportionately poor with lower educational levels than its urban population (Library of Congress 1997). Watson and Anchinelli’s study of a community of small coffee farmers in the Brazilian state of Minas Gerais revealed that literacy rates are the lowest in the state and only 66% of farmers have completed primary school (2008, 230).

**Summary and significance**

To sum up, futures trading requires extensive access to information and well-developed skills and knowledge in order to put this information to good use.

Across the three case countries, information availability was found most problematic in Uganda where infrastructure is poorest and incomes lowest. The Ugandan case further illustrated that different vehicles for information access are viable in different country contexts—here, radio and cell phone information services appear most promising. Despite the fact that the task of providing farmers with timely market information is likely most difficult and least affordable in Uganda (where individual incomes and government revenues are very low, and infrastructure is least developed), the Uganda Coffee Development Authority has nonetheless embarked upon an ambitious program to provide coffee farmers with said market information. The new MIS, while still in its infancy, is a potential future vehicle for rapid information transmission to rural areas.

In Brazil, the existence of a domestic futures market, combined with relatively higher rates of radio and cell phone usage, potentially affords informational opportunities not available elsewhere. As in Uganda, the Brazilian government has also established a MIS. Yet, the technologies required to access said information (computer and Internet) precludes a large portion of the farming community from using the system.
In Mexico, while there is a domestic derivatives exchange, coffee contracts are not offered. This suggests that informational problems might be less severe in other crop contexts crops for which contracts are offered on the exchange, than they are in the coffee context. Much like Brazil, cell phone and radio usage rates indicate that these are the most likely vehicles for information dissemination.

Several different general conclusions might be drawn here that are relevant to policymakers. First, MIS or other programs to deliver timely market information to coffee farmers must utilize those informational vehicles most widely used by farming communities themselves. That Brazil’s MIS relies on computer and Internet technology suggests a potential mismatch between the information delivery vehicle chosen and the vehicles most widely available to farmers. Second, and likely more important, none of the MIS discussed, be they national-level efforts or the initiatives of international organizations, currently disseminate futures market information.

Third, while it is possible that the existence of a domestic futures exchange may make market information cheaper and more readily available, it is far from clear that policymakers should endeavor to erect an exchange of their own (or in Mexican case, add coffee contracts) in order to rectify the problem. One concern lies in the fact that in my own case, the BM&F in Sao Paulo was more than happy to provide me with historical and current futures market information free of charge. However, the data came packaged as a Microsoft Excel file. Indeed, the mere existence of a domestic exchange does not ensure the availability of timely and accurate market information to coffee farming populations, many of whom do not have the luxury of a laptop, appropriate software and wireless Internet.
Last, agricultural liberalization has simultaneously increased farmer needs for timely and accurate information (e.g. to manage risks, avoid fraud at the farmgate, etc.) and made the acquisition of such information more difficult in the three cases due the devolution and underfunding of AES and the dismantlement of marketing boards.

My own cautious assessment of likely information obstacles contrasts rather sharply with recent statements from researchers at the IISD. For example, Rutten and Youssef note that, “By and large, farmers are now well aware of international prices (in many countries, they listen to the BBC’s World Service’s coverage of coffee futures prices and equivalent price information services) (2007, 10).” Such a statement is not only misleading to policymakers insofar as it glosses over and ultimately dismisses a serious market access obstacle, but it is also empirically inaccurate. Even in Mexico and Brazil, where radio usage rates are relatively high compared to Uganda, less than half of the surveyed population of each country has a radio at all.

Further, I would like to emphasize, again, that access to the present day’s future prices (which may or may not be accessible over radio or mobile phone) are wholly inadequate to formulate and execute hedging strategies. For example, my own experience devising hedging strategies suggests the crucial importance of historical price information on all available contracts for a period of several years. I also made extensive use of present and historical volume and open interest figures. This is not information that can be easily disseminated orally over the radio.

Additionally, while the discussion of knowledge was rather general, two points deserve mention in summation. First, technical capacity is a broad obstacle to effective futures use. Anecdotal evidence points to the likelihood that capacity building efforts
will be very difficult, very expensive and very time-consuming. The ITF, having experimented with capacity building in a host of coffee-producing countries, is now unsure about who to train. Training of farmers and even leaders of farmer cooperatives has already proven to be a non-starter in several cases.

Second, risk management instruments that confuse Nobel Prize winners may simply not be appropriate in farming communities where educational levels are low, educational opportunities are sparse, ICT infrastructure is poorly developed and incomes are barely sufficient to cover even most basic needs. In the sections that follow and in Chapter 6, the socio-economic position of small coffee farming communities in the three case countries is discussed in more detail. I ask to reader to recall these information and knowledge obstacles later in that context as well.

**Summary and significance**

This section of the chapter has detailed the nature and extent of access-related obstacles to futures trading particularly for small coffee producers in the three case countries. While futures market access is problematic for many different kinds of coffee farmers, farmers with a particular constellation of traits and characteristics appear most likely to be systematically excluded: small farm size, little to no means to manage yield risk, no credit, assets or savings with which to finance trading, little to no access to information and information technologies and little knowledge of futures hedging. The problem of smallness discussed in Chapter 2 can thus also be found in here—in addition to the many other markets discussed there, small farmers also have a very difficult time accessing futures markets. This is not only due to size, but also because being a small farmer entails other, related disadvantages in a liberalized market setting.
To some extent, my cynical tone throughout is intended as an antidote to what I consider to be false optimism on the part of many development researchers about the desirability of new programs, policies and institutions to overcome these access obstacles.

While most scholars on this topic do indeed mention access problems, two policy-related oversights stand out as being of special importance:

1. Researchers often minimize or ‘gloss over’ the multi-faceted nature and severity of access problems for large numbers of producers.

2. Researchers often take for granted that policy efforts to overcome these obstacles are worth the time, energy and resources of policymakers, farmers, international institutions and other actors that may be involved in such efforts.

To my mind, the second point is directly related to the first. Advocacy of new institutions and policies to overcome access obstacles (e.g. from the ITF and UNCTAD) is perhaps grounded in the notion that these constraints are minor ones. While this may be the case in other countries and/or for producers of different crops, this does not appear to be the case for coffee producers in Mexico, Brazil and Uganda.

The evidence I have marshaled above suggests that a different policy conception of access obstacles is warranted. Limitations on farmer access to futures markets are multi-faceted, severe and applicable to very large segments of the coffee farming community in each country case. This suggests that efforts to overcome access obstacles by international organizations, governments, non-profits and other actors will not be quick, cheap or easy.
For example, due to very large farm sizes relative to other coffee-producing countries the Brazilian case perhaps represents the case where small output levels will impact the fewest numbers of farmers. Yet, even in Brazil it is likely that some 40-50% of the country’s coffee farmers are excluded from trading on the domestic exchange. And, if size obstacles appear daunting in Brazil, they are even more so in Mexico and Uganda where virtually all farmers are excluded. Policy efforts to aggregate the output of small farmers will likely involve substantial time and resources.

As another example, my analysis of yield risk in the three country cases suggests additional costly and time-consuming pre-requisites for effective futures trading. Excluding perhaps the most wealthy farmers that have reliable access to credit, savings and other assets, many coffee farmers in the three case countries would be potentially negatively and severely impacted by fluctuating yields with a hedge in place. The negative effects of yield risk on the financial positions of short hedgers are so severe that one researcher suggested that not hedging at all was the safest bet under such conditions. It stands to reason, then, that significant time and resources will also have to be invested in arrangements to manage yield risk in order that small farmers can hedge effectively.

The same case can be made in reference to costs, information and knowledge: given the scale and severity of these obstacles, it seems very likely that large amounts of resources, time and energy will have to be devoted to overcoming them. But, might these resources be better spent elsewhere? Again, the answer is not obvious. Caution is perhaps warranted by policymakers.
A summary chart of the empirical results of this discussion of access-related assumptions appears in the “Conclusions” portion of the chapter, for the readers reference.

The next section interrogates my own assumption thus far that futures market access is important and that exclusion is problematic for farmer well being.

**Does access matter?**

This chapter’s discussion has thus far implicitly asserted that futures market access is important. It also assumed by extension that exclusion from futures markets is problematic for farmers and their families as well as policymakers. This section interrogates this assumption along two separate lines. First, I discuss immediately below the contention of some economists that the ability to hedge is not very important because farmers reap the major benefits of futures markets simply by monitoring and acting upon future prices. Second, I discuss in more detail the experiences of coffee farmers in the three case countries during the coffee crisis. The evidence suggests that wealthier and larger coffee farmers are likely least negatively affected by futures market exclusion, whereas small and poor farmers are likely most harmed thereby. I go on to argue that this is doubly problematic for policymakers.

**Does access matter? Price discovery and farmer welfare**

Some economists argue that the hedging (risk shifting) function filled by futures markets is at best secondary to the role of futures markets in predicting future cash prices. This implies that access to futures markets for farmers is not a matter of serious concern as the major benefits conferred by futures markets may be obtained by simply monitoring
and acting upon these price predictions. Despite the assertions of many economists (like Black below), existing evidence about the predictive efficiency of coffee futures markets casts some doubt upon this position and suggests that whatever income benefits might be gleaned from coffee futures markets, they are likely to accrue to those who hedge.

Fischer Black, a towering figure in the derivatives field, writes:

I believe that futures markets exist because in some situations they provide an inexpensive way to transfer risk, and because many people both in the business and out like to gamble on commodity prices. Neither of these counts as a major benefit to society. The big benefit from futures markets is the side effect: the fact that participants in the futures markets can make production, storage, and processing decisions by looking at the pattern of futures prices, even if they don’t take positions in that market (in DeRosa, ed. 1998, 143; emphasis added).

In particular, Black emphasizes the importance of storage decisions in minimizing the fluctuations in the price of a commodity over time. Looking to the prices discovered on futures exchanges, farmers can make those marketing and storage decisions that minimize the impact of seasonal price fluctuations on incomes. This same point was made earlier in the discussion of storage in Chapter 4—the decision to store some coffee for sale at a later date allows farmers to “price average”. Futures markets, insofar as they can predict the price of coffee some time into the future, indicate whether and to what extent such storage will be worthwhile. Note, however, that storage is not a solution to long-term secular declines in commodity prices (see Chapter 3).

Other scholars have made similar comments about the potential welfare benefits of price discovery for farmers, independent of their use of the markets to hedge. The World

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84 Black is discussing the impact of price discovery in aggregate. If futures prices serve as storage guides, individual storage decisions can in aggregate reduce fluctuations in the cash price over time as supplies are held or released. For any given individual producer, however, storage potentially allows for the minimizing of the financial (income) impact of seasonal price fluctuations.
Bank argues that, “Futures and options markets in developed countries represent important price discovery references for international commodity markets (2005, 9).” Mohan notes in the coffee context that, “Several commentators feel that futures price quotes for commodities traded in well established international commodity exchanges can serve as useful proxies for price expectations … coffee producers have the option to take production, marketing and storage decisions on the basis of LIFFE or NYBOT coffee futures forecast information (2004, 983-4).”

The extent to which future prices can act as helpful guides for farmers in making production, investment, storage and marketing decisions depends crucially, as Black himself notes, on the efficiency of futures markets. He writes as a corollary to his statement above: “This, of course, assumes that futures markets are efficient. It assumes that futures prices incorporate all available information about the future spot price of a commodity [the efficient market hypothesis]. It assumes that investors act quickly on any information they receive, so that the price reacts quickly to the arrival of information (in DeRosa 1998, 143).” Stennis similarly notes that the viability of the price discovery mechanism, and its correlate welfare benefits, depends upon the “extent to which futures prices are unbiased point estimates of subsequent cash prices” (1983, 308). Put differently, only in situations where futures prices are the best possible predictors of future cash market prices (predictive efficiency) will the use of future prices as guides be helpful for farmers. In scenarios where the future price is not a good predictor of cash prices, looking to future prices for guidance will lead to welfare reductions for farmers as they make mistakes and miscalculations (relative to actual cash market price trends) in regard to production, storage, investment and marketing.
Mohan, recognizing the dependence of price discovery’s benefits for farmers upon the efficiency of futures markets, endeavors to test their predictive abilities: “In this paper, we infer, on the basis of empirical analysis, whether producers can benefit from taking such decisions or whether such planning can result in welfare loss and misallocation of resources. In other words, we test the forecast efficiency of coffee futures and investigate the extent to which it can reduce coffee producers’ price risk exposure (2004, 984).” The results of Mohan’s tests for the ICE (NYBOT) and LIFFE markets are very revealing. They are all the more relevant for my own analysis because the years covered in the test include the years of the 1998-2002 coffee crisis.

First, the results are virtually identical for both exchanges. Second, “It is difficult to establish any clear-cut relationship between futures and spot prices, except the fact that futures prices are more adaptive to the prevailing (current) spot price, rather than futures prices reflecting or predicting subsequent spot prices (2004, 999-1000).” This implies that cash prices may be as good a guide for producers as are futures prices because future prices simply lag behind cash prices. Third, he finds that the markets perform even this adaptive function rather poorly, with spot prices deviating from futures prices by about 30% on average (Mohan 2004, 1000, emphasis added).

Fourth, the larger the “forecast lag”, or the distance into the future that coffee futures markets extend their predictions, the larger the deviation of spot from futures prices (Mohan 2004, 1000). This means that futures markets do a better job predicting cash market prices in the very near future than they do as the time horizon recedes. The rather large deviations between spot and future prices beyond 3-4 months leads the author to argue that “futures market information does not reduce the price uncertainty faced by
coffee producers” to any extent beyond this time horizon (Mohan 2004, 1000). As has been noted throughout, this short time horizon is problematic for producers of perennial crops like coffee who are trying to decide whether to plant new trees or to invest in the upkeep of older trees. It is also problematic in the context of decisions made within a single crop season. Coffee farmers harvest over the course of several months, 5-6 months in the cases of both Mexican and Ugandan farmers. Decisions about how much seasonal labor to hire, or whether to harvest at all, are not helped by price forecasts of limited accuracy over a short 3-4 month period. In other words, the forecasting abilities of futures markets (what little there is) extend over a time horizon that is mismatched with the various time horizons incorporated into important farm-level decisions.

Last, Mohan found that there is no systematic pattern in the bias shown in futures markets prices—“at times the forecast price proved to be higher than the subsequent spot price and vice versa at other times (2004, 1000).” He thus concludes with pessimism about the benefits of using prices discovered in futures markets to guide farm-level planning: “The analysis, therefore, fails to support the price-signaling role of futures prices (Mohan 2004, 1000).” His evidence suggests that, absent the capability of farmers to use futures markets to hedge, little benefit (perhaps none at all) can be expected for coffee farmers from the price discovery mechanism. In fact, farmers may become worse off if they do look to futures prices to make planning decisions. Futures market access (the ability to hedge) is thus crucial from an income security perspective, for price discovery alone promises no (or negative) income benefits.85

85 While such studies call into the question the price discovery mechanism in the NY and London markets, no comparable study has been performed to test the efficiency of the BM&F coffee futures markets. Thus,
The volatility of futures prices represents an additional, important consideration here. It is often remarked that cash market prices are sufficiently volatile as to often provide farmers with conflicting signals about what sorts of production, storage, investment and marketing decisions to make. As mentioned earlier, asymmetric supply responses combined with the several years required for coffee trees to reach maturity, makes price volatility even more problematic. UNCTAD complains that futures prices are also volatile and may not allow farm-level decisions to be made with any more certainty: “In any case, it is doubtful if the futures markets are as suitable for addressing problems emanating from price volatility as they are for the reduction of uncertainty in revenue flows…commodity futures prices are only slightly less volatile than cash prices (2003, 40-1).” In this respect as well futures markets appear to more useful insofar as they can stabilize, predict and augment incomes than they are in guiding farm level planning decisions.

While this section made a general argument about the importance of access, the next section argues that futures market exclusion is problematic especially from the perspective of small farmers.

Does access matter? Large versus small producer vulnerability to risk

One of the most significant findings from recent poverty and vulnerability studies, validated across a huge variety of circumstances, is that exposure to financial shocks has a larger, negative impact on the poor than it does on individuals who are wealthier and

I cannot conclude that Brazilian farmers are potentially misguided by futures prices in the same manner as are Mexican farmers looking to New York and Ugandan farmers looking to London.
have more assets. While wealthier individuals with assets are generally able to withstand a financial shock without serious harm to their well-being, poorer individuals often “cope” by taking measures that are generally harmful in welfare terms. Absent wealth/assets and/or another effective and comprehensive system for risk management, financial shocks make the poor even poorer.

Existing research on the impact of the coffee crisis in the three case countries confirms this more general finding: the poor, who tended to be smallholders, were hurt disproportionately by the coffee crisis relative to larger and wealthier producers. This suggests that the income security benefits of futures hedging are most important in welfare terms for small, poor farmers particularly in the absence of other income security arrangements. However, it is precisely small, poor farmers who are most likely to be systematically excluded from futures market participation. This is very problematic from a policy perspective. Below I elaborate.

The previous chapter noted that capital rationing and the use of costly coping mechanisms are among the most common responses to (expected) income shocks by individuals and families that lack assets, credit, savings or alternative sources of income. Income shocks do not have the same effect on individuals and families that are wealthier and have more assets. A study by Rosenzweig and Binswanger revealed that the farm profits of poor Indian households exposed to the risk of monsoon dropped by roughly 35%, but that wealthier farmers’ profits were not affected at all (in Morduch 1999, 187-88). The ILO notes that, “In general, a poor person cannot insure to anything like the extent that a rich person can, and yet is almost certainly exposed to more risks, more uncertainty and more adverse outcomes (2004, 11).”
Further, Davis’ study of *ejido* producers in Mexico since liberalization began in the 1980s reveals that wealthier producers were able to respond to increased risk and uncertainty more effectively than poorer producers. Specifically, producers with larger plots of land, greater levels of assets (like livestock) and more “human capital assets” have been better able to adjust to the risks associated with economic liberalization than producers with less land, less human capital and few to no assets. While the former group has invested in more cattle as well as fruit and vegetable production (which is less prone to low prices than corn, which was farmed almost exclusively before liberalization), poorer producers continue to struggle. “These households, with less land, livestock, migration and human capital assets, have significantly lower household incomes than the households referred to above that have been able to adjust successfully. Without access to adequate levels of assets, these households will continue to struggle in the current austere macroeconomic environment (Davis 2000, 103).”

The mixed experiences of Mexican, Brazilian and Ugandan farmers during the coffee crisis illustrates the same general pattern. In Uganda, the vast majority of coffee farmers are very small (see above) and exceptionally poor. Sayer (2002) notes that with a per capita income of just over USD$1000, Uganda is ranked 162 out of 191 countries ranked according to per capita income. At the beginning of the 1990s, over 50% of the population of Uganda was characterized as “poor” (Okidi and Mugambe 2002, 2). In the mid-1990s, poverty among producers of cash crops in Uganda stood at about 40% (Okidi and Mugambe 2002, 11). The UNDP notes that of the 70% of Uganda’s population that works in agriculture, more than 40% live in poverty (UNDP 2007).
As is predicted by poverty and vulnerability studies more generally, the coffee crisis induced the following behaviors, typical of poor, risk-averse farming families working small plots of land: “Families are reduced to subsistence farming, growing foods to eat while struggling to buy essentials like sugar, soap, salt, kerosene, tools and clothes … Secondary school enrollment has declined as tens of thousands of children are sent home for lack of fees (Sayer 2002, 10).”

In Brazil, Watson and Anchinelli’s study of poor, coffee smallholders revealed similar results. While the fazendas are indeed negatively impacted by price declines, smallholders are much more adversely affected: “Small-scale producers in these areas are most vulnerable to instability on the world coffee market, as their incomes are precariously tied to world coffee prices (Watson and Anchinelli 2008, 227-9).” Gresser and Tickell (2002) similarly find that Brazilian smallholders, like smallholders in so many other producing countries, were most negatively impacted by the crisis.

In Mexico, 90% of the country’s coffee is grown in four southern states of Veracruz, Chiapas, Oaxaca, and Puebla by small producers, many of whom are indigenous peoples. The ITF (2002) reports that some 180,000 of Mexico’s 282,000 producers are indigenous with coffee being their main or only source of cash income. And, the small producers that dominate the south tend to be very poor relative to the rest of the country’s inhabitants: “In 1996, the four main coffee producing states Chiapas, Oaxaca, Puebla and Veracruz had a per capita gross internal product that was around 43 percent of Mexico’s average for Chiapas and Oaxaca, and around 64 and 67 percent for Veracruz and Puebla respectively (ITF 2002, 6).”
As in Uganda and Brazil, it was Mexico’s smaller and poorer coffee farmers that experienced the most hardship during the crisis, while wealthier, larger farmers fared much better. A recent study by Eakin and colleagues of small coffee producers in Veracruz found that during the crisis almost 72% of producers reduced their harvest, 62% “reduced use of purchased inputs”, almost 97% were “negatively affected” in their “ability to acquire basic goods”, and 80% were less able to pay medical expenses (2006, 164). The study crucially finds that households with “access to market and technical information, finance and having sufficient land with which to diversify into alternative crops” were better able to deal with the crisis (Eakin et. al. 2006, 168-9).

All this is to say that wealthier farmers with more assets are better able to cope with income shocks than are poorer farmers with fewer assets. Put differently, wealth and assets, especially land, enable farmers to weather income shocks without serious negative consequences for their welfare, even in the absence of formal and informal risk sharing arrangements—wealth and assets are themselves a means of managing risk, smoothing consumption, and enabling productive investments during price shocks. Poorer and smaller farmers, on the other hand, often undertake activities that negatively impact welfare when faced with (the prospect of) income shocks. Field research in the three case countries has verified these general trends during the coffee crisis.

This is exceptionally problematic in the context of futures market access. Indeed, the farmers and families that need risk management most—those who are poor and small—are precisely those farmers that are excluded from futures markets. Yet, those farmers that need such arrangements least—larger, wealthier farmers that have other ways to successfully deal with shocks—are those who are best positioned to reap the benefits of
hedging. This is a crucial point from a policy perspective. Absent other, pro-poor income security arrangements, recommended and implemented simultaneously, advocacy of futures and hedging turns the “needs-based approach to sustainable development” on its head. Rather than placing a priority on helping the poorest in society, the integration of futures hedging into coffee policy to the exclusion of pro-poor alternatives places an implicit priority on helping those who need help least.

**Summary and significance**

This section has made two arguments as to the importance of futures market access. First, it was argued that price discovery is not a substitute for hedging. Future prices are often bad predictors of future cash prices (especially past 3-4 months forward) and can also be very volatile, calling into question the welfare gains of using futures market predictions as farm-level production guides. In this view, most if not all farm-level gains from futures markets are a consequence of hedging, which requires access. Please recall also that the income security gains from hedging are themselves uncertain and ambiguous, with hedging destabilizing incomes under certain conditions. In certain scenarios, then, exclusion from futures hedging may actually be a welfare boon.

Second, I argued above that access obstacles are problematic for an additional reason. The access discussion in the first part of the chapter concluded, among other things, that farmers with a specific, linked constellation of traits and characteristics were most likely to be excluded from futures market participation: small, poor, low educational levels, little to no past experience with futures, etc. (see above). I argued that this is troubling from a policy perspective, for it is exactly this community of coffee farmers that is in greatest need of the income support potentially provided by futures hedging. By
contrast, larger and wealthier farmers, who are already advantaged in risk management terms due to their generally higher levels of assets and savings, are best positioned to reap the income security benefits of hedging. This directly contradicts the policy wisdom suggested by a needs-based, pro-poor approach to sustainable development.

In the next section I incorporate the discussion of access thus far into a discussion of the relative income dynamics that can result from hedging.

**Access and income inequality**

Of the four dimensions of the producer income problem discussed in Chapter 2, only one has yet to be systematically analyzed: income inequality. Recall from that chapter that there appeared to be some confusion among researchers about the role that futures markets might play in ‘leveling the playing field’ both among large and small farmers, and among the various actors along the GCCC. Having discussed access difficulties, it is now possible for me to sketch and discuss the possible relative income effects of hedging with futures. As has been the case throughout, the results are ambiguous. In some cases, exclusion from futures markets may worsen the distribution of income across farmers of different types and along the GCCC. In others, exclusion from futures markets may improve the relative income position of farmers excluded from futures hedging. Below I elaborate on the relation between futures market inclusion and exclusion, and relative income levels.

The data presented in the previous chapter as to the impact of futures hedging on absolute income levels is also suggestive of some of the relative income dynamics that may result from hedging. The fact that the gains from all hedging strategies were
positive (with the exception of the last year of Rollover #2, 2002-3, in Uganda) leads to the conclusion that in an environment of falling prices like that of the coffee crisis hedging with futures will raise the incomes of farmers.

Of course, this also means that farmers that do not hedge with futures while prices are falling may see their incomes falling relative to the incomes of farmers that do. In this manner, hedging with futures may create, or reinforce already existing, income disparities between coffee farmers. Indeed, a Brazilian or Mexican farmer that hedged via Rollover #2 during the coffee crisis, would, over 4 years time, have seen her total income more than double relative to a farmer that did not hedge at all. A Ugandan farmer who hedged with #2 would have seen income more than triple relative to a farmer who did not hedge.

It is also important that I note the correlate of this finding: in an environment of rising prices, hedging with futures will diminish the incomes of farmers relative to not hedging. This was seen in the last year of Rollover #2 and the plain annual hedge in Uganda (total income was positive, but hedging income was negative). As noted in Chapter 3, hedging with futures contracts theoretically allows for income smoothing, precluding income losses as well as income gains. This has potentially important implications for the impact of futures usage on the distribution of income among farmers. If futures prices are rising, farmers that do not hedge will likely see their incomes rising relative to the incomes of farmers that do hedge. That said, this effect will likely be smaller than the relative income effect in an environment of falling prices. Farmers with a short hedge in place when futures prices are rising will simply lift the hedge and cut
their losses. These dynamics are also implied in Dodd’s recent work on rollover hedging (2007), although he does not explicitly speak about relative income dynamics.

Moreover, these data suggests that the distribution of income along the coffee commodity chain (pictured in Chapter 3), between producers and consumers of coffee (like roasters, retailers, manufacturers, and international traders), may improve when farmers hedge in an environment of falling prices, as these big consumers are some of the many actors that take a long position in the futures market opposite the farmer’s short position and thus pay farmers when prices fall. This same dynamic might also occur if farmers do not hedge, as long positions lose in an environment of falling prices. However, in an environment of rising prices hedging by farmers may worsen the distribution of income along the chain as they pay out part of their coffee revenues to holders of long positions. And, even if farmers do not hedge this dynamic might play out considering that long positions gain in an environment of rising prices.

Below appear two matrices that capture the potential relative income (distributive) effects of hedging with futures contracts. The first details potential distributional consequences among farmers, both of which are assumed to take a short position in the futures market, have the same output level and to utilize the same hedging strategy when both hedge. The second matrix does the same but for the coffee commodity chain. I assume for this second matrix that all coffee consumers take long positions and that all

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86 The Commodity Futures Trading Commission’s (CFTC) weekly “commitments of traders” reports for the NYBOT/ICE coffee futures market from 2006 reveal that reportable “commercial long positions” (positions of 50 contracts or more must be reported), which generally represent large buyers/consumers of coffee like roasters, manufacturers and international traders, represent anywhere from 30% to 50% of open interest in the market in any given week. This means that it is likely that a farmer’s gain is a roaster’s loss. Of course, speculators with “non-commercial” positions also pay out and get paid, making an income inequality evaluation significantly more complicated. See www.cftc.gov for commitments of traders reports.
coffee producers take short positions (which is usually the case in reality; sometimes international traders “spread”, or take both long and short positions). I also assume that, in the event that consumers/producers decide not to hedge (because prices are falling/rising, which is good for their bottom line), speculators will rise up to fill this liquidity deficit. In other words, there is always a counterparty available to offer/purchase the contracts that consumers/producers want to buy/sell. It’s important to keep in mind that the situation is in reality infinitely more complex than the charts below suggest. The presentation of each matrix is followed by a description of the dynamics involved.

**Figure 5.4: Hedging and the distribution of income among farmers**

<table>
<thead>
<tr>
<th></th>
<th>FALLING FUTURES PRICES</th>
<th>RISING FUTURES PRICES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEDGES</td>
<td>NO HEDGE</td>
</tr>
<tr>
<td>Farmer #1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ Farmer #2</td>
<td>HEDGES</td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td></td>
<td>NO HEDGE</td>
</tr>
<tr>
<td>HEDGES</td>
<td>Income differential</td>
<td>Farmer #2’s income</td>
</tr>
<tr>
<td></td>
<td>stays constant</td>
<td>rises relative to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Farmer #1</td>
</tr>
<tr>
<td>NO HEDGE</td>
<td>Farmer #1’s income</td>
<td>Income differential</td>
</tr>
<tr>
<td></td>
<td>rises relative to</td>
<td>stays constant</td>
</tr>
<tr>
<td></td>
<td>Farmer #2</td>
<td></td>
</tr>
</tbody>
</table>

The matrix above attempts to present a spectrum of relative income outcomes that could result from hedging with futures in the context of two farmers. Recall that each is assumed to be a short hedger, to utilize the same hedging strategy and to hedge the same quantity of output. In four of the eight boxes, those shaded in grey, the income differential between the two farmers stays constant. This is because both farmers are
performing precisely the same operation under exactly the same conditions. For example, when both hedge in an environment of falling/rising prices, the income differential between the two farmers stays constant. The same is true when both do not hedge in both price environments.

If, however, I suspend the assumption that both farmers hedge the same quantity of coffee, the situation appears much different. Even if both farmers hedge using the exact same strategy, the farmer who hedges a greater quantity of output will reap greater income rewards. This is because the absolute income gains (and losses) from hedging are proportional to output levels. This suggests a crucial policy implication. Given two farmers, one larger and one smaller, both of whom can and do effectively implement the same hedging strategy in an environment of falling futures prices, hedging will worsen the distribution of income between them. Futures market access, then, is no panacea for income inequalities across different types of farmers.

The remaining four boxes, those with a white background, illustrate the potential income distributive dynamics that would likely arise as a consequence of access obstacles and futures market exclusion. Recalling the assumptions that were originally in place, the bottom left white box suggests that when Farmer #1 hedges and Farmer #2 does not, in an environment of falling prices the income of Farmer #1 will rise relative to the income of Farmer #2. If Farmer #2 is instead the hedger in this price environment, her income will rise relative to Farmer #1.

By contrast, the opposite dynamics prevail in an environment of rising futures prices. Here the inability to access futures markets is actually beneficial in relative income terms. In this price environment, the upper right hand white box indicates that when Farmer #1
does not hedge and Farmer #2 does hedge in an environment of rising prices, Farmer #1’s income will rise relative to Farmer #2 because the latter is sustaining losses in the futures market. If instead Farmer #2 does not hedge, her income will rise relative to Farmer #1. As mentioned earlier, it is likely that the relative income gains from not hedging in an environment of rising prices will be smaller than the relative income gains from hedging in an environment of falling prices. This is due to the fact that a hedger who sustaining losses on his position will likely close out the position long before the contract approaches expiry.

Overall, the impact of access obstacles and exclusion upon relative income dynamics among farmers is ambiguous. In some circumstances, exclusion results in a worsening distribution of income. In others, exclusion improves relative income dynamics. Further, the discussion above casts doubt upon the notion that improving the ability of small farmers to access futures markets will facilitate a more equal distribution of income between actors.

I would like to note that access problems are not the only reason that such distributive dynamics may result. While some farmers may not hedge because they simply cannot, other farmers may not hedge because they do not want to. There is evidence that some farmers decide not to hedge with futures because they do not want to preclude income gains if prices rise. Speaking about North American cereal farmers, Gardner writes that farmers “do not want to foreclose the prospect of above-average prices” (2000, 5). UNCTAD speaks more specifically to the situation of developing country farmers: “Within the group of farmers and even within each sub-group, there are significant differences in the degree of risk aversion. While many farmers are willing to
give up part of their income to reduce their risk exposure, a significant proportion is not
(2002, 6).” In Chapter 4, Newberry and Stiglitz (1981) were quoted as suggesting that
farmers may decide not to hedge because their expectations about the future are different
than those of the market. The ITF (2002) confirms this to be the case for a handful of
Mexican coffee farmers during the crisis who decided not to hedge in 2001 because they
thought that prices could not get any lower (they did, but that is beside the point). This
point is also relevant to the discussion immediately below about the impact of hedging on
the distribution of income along the GCCC.

Figure 5.5:
Hedging and the distribution of income along the global coffee commodity chain

<table>
<thead>
<tr>
<th>Producers (farmers) → Consumers (retailers, manufacturers, international traders, roasters) ↓</th>
<th>FALLING FUTURES PRICES</th>
<th>RISING FUTURES PRICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producers (farmers) → Consumers (retailers, manufacturers, international traders, roasters) ↓</td>
<td>HEDGE</td>
<td>NO HEDGE</td>
</tr>
<tr>
<td>Producers (farmers) → Consumers (retailers, manufacturers, international traders, roasters) ↓</td>
<td>Income flows from consumers to producers</td>
<td>Income flows from consumers to producers with short positions</td>
</tr>
<tr>
<td>NO HEDGE</td>
<td>Income flows from speculators with long positions to producers</td>
<td>Income flows among speculators</td>
</tr>
</tbody>
</table>
The matrix above assumes that there are three types of actors trading in futures markets: producers, consumers and speculators. In further assumes that producers are short hedgers, consumers are long hedgers, and that speculators go both long and short. While certainly inadequate to address the complexity of futures markets and all of the variables that may impact relative income dynamics, the matrix above does capture some important general dynamics.

To start, hedging with futures can be a mechanism for redistributing income from consumers to producers. This is the case in the upper left hand box in the matrix, where both producers and consumers hedge in an environment of falling futures prices. In some cases, a farmer’s income gain is a roaster’s or manufacturer’s income loss. If, however, farmers are excluded from futures markets and cannot hedge and consumers are able to hedge, in an environment of falling futures prices the income of roasters and manufacturers may flow instead to speculators in the market. This is indicated by the upper left hand middle box in the matrix. If it is the consumers who do not hedge in an environment of falling prices, it will be the speculative holders of long positions who pay hedging producers. This is indicated by the lower left hand box in the matrix. Last, if both producers and consumers are not hedging, income simply flows between speculators of various types.

To sum up, if farmers can hedge in an environment of falling prices their incomes will rise and these income gains will come at the expense of either coffee consumers or speculators. Even if farmers cannot hedge, they may still gain income ground relative to coffee consumers in certain scenarios (i.e. if consumers lose money to speculators).
The relative income dynamics that prevail in an environment of rising future prices are far more worrisome from the farmer’s perspective. In two different scenarios, coffee farmers will actually lose part of the income to consumers and speculators. If both producer and consumer hedge in such an environment, the farmer will have to pay the roaster/manufacturer and will see his relative income position deteriorate. This is the upper right hand middle box in the matrix. If the producer hedges and consumers do not, the producer will instead lose income to speculators. This is the lower right hand middle box. If producers do not hedge but consumers do, the relative position of producers will still deteriorate but it will be speculators who pay the consumer instead. This is the upper right hand box in the matrix. If both producers and consumers do not hedge, speculators of different sorts pay one another. This is the lower right hand box.

Overall, then, it is far from clear that providing coffee farmers of any size with access to futures markets will improve the distribution of income along the GCCC in their favor. In some cases, hedging with futures can worsen the distribution of income along the chain from the farmer’s perspective. Again, please keep in mind that a whole host of unknown variables will in reality impact relative income outcomes, including the specific hedging strategies used by different actors, cash and futures prices, the size of the position actors take in the market, which market they trade in, and when actors decide to lift hedges if prices move differently than expected, among other variables.

**Summary and significance**

As the matrices above suggest, the income distribution that might result from policies that encourage farmers to use futures markets (to the exclusion of alternatives)
varies across different conditions and is to some extent unclear and ambiguous. That said, some tentative conclusions might be drawn.

If futures markets are taken up by policymakers and recommended to farmers for income security purposes, several distributive dynamics might be expected. Assuming for now that small, poor farmers have no other real income security alternatives (an assumption that is not so unrealistic—more in the next chapter), it is reasonable to conclude that such policies will work to the advantage of those who need help least in an environment of falling future prices (e.g. the coffee crisis). This is for two reasons: hedging in such an environment is profitable; and, small, poor farmers cannot access futures markets at the present time. Farmers that are big enough, wealthy enough, and have the information and knowledge necessary to hedge effectively (this is admittedly a small population) will see their incomes rise dramatically relative to farmers who cannot access these markets.

Further, the relative income advantage conferred on non-hedgers in an environment of rising prices will not likely be sufficient to balance out the relative income losses accrued in times of falling prices. This is because larger farmers with a hedge in place when prices start to rise will simply lift their hedge to reduce losses. Over time then, if access remains problematic, systematic recommendation of futures markets to the exclusion of other income security arrangements will result in broadening income gap between smaller and larger farmers (those with no access and those with access).

The access problem raises further distributive concerns in the context of the GCCC. Several observers have pointed to the fact that while farmers are often precluded from
futures trading, large corporate consumers regularly hedge on futures exchanges. For example, Gresser and Tickell note that:

Roasters have extremely advanced ways to manage and minimize risks to their raw materials costs. Instead of paying the current market price, they construct contracts with traders that enable them to spread and hedge the risks of future price volatility. Complex mathematical modeling allows them to use futures markets through a simple click of a computer mouse, leading to agreements today on a price to be paid for coffee they will purchase in six to 18 months’ time. Such financial tools allow them to optimize their purchasing strategies – a far cry from the severely limited market options facing producers (2002, 27).

Ponte makes a similar comment in regard to international traders: “Those trading firms that have survived are hedging increased risk through futures market operations. Local actors in producing countries do not have the same ease of access to hedging instruments (2002, 1116).” If large corporate consumers along the GCCC can hedge against the risk of rising prices, and if farmers cannot hedge against the risk of falling prices, over time the distribution of income between these nodes on the chain will worsen. While roasters for example may lose income if a hedge is in place and prices fall, their gains from hedging when prices rise will likely exceed this over the long term. This is for the same reason as above—roasters will lift their hedge if prices start to fall, limiting the extent of their losses. For the same reason, farmers may lose relatively more from not hedging when prices fall than the relative gain from not hedging when prices rise. These dynamics suggest a worsening of the distribution of income along the GCCC over time, simply because some actors can hedge and others cannot.

Yet, even if all farmers, large and small alike, could hedge without any impediment to access or effective use of futures markets, sustained, systematic hedging would still likely result in a worsening distribution of income. The gains from hedging are not
distributed according to need. Rather, income gains accrue to hedgers in proportion to their output levels. Larger farmers trading in more contracts will receive absolutely more income than small farmers if both hedge in an environment of falling prices. This can be seen with the data from Chapter 4 insofar as the ‘hypothetical’ large farmer earns much more than the average sized farmer who informs the calculations in this chapter even though both use the same strategy at the same time in the same environment.

Assuming that hedgers will lift the hedge if prices do not move as expected, then large farmers will lose more than small farmers when prices rise, but not as much as their relative gains when prices were falling. A sort of ‘ratcheting’ effect might thus be expected whereby larger farmers and smaller farmers managing their risks in exactly the same way see their incomes diverging slowly over time. To the extent that coffee consumers regularly hedge a larger quantity of coffee than coffee producers, the same might be said of the income distribution along the GCCC if all actors had access to futures markets.

**Conclusions**

To sum up, below I summarize the major conclusions of this chapter’s analysis and discuss their significance for policymaking. In particular, this chapter has: detailed the nature and scale of futures market access problems in the three case countries; argued that access is problematic from a welfare perspective for two distinct reasons; and, has addressed the impact of hedging and futures market exclusion on relative income dynamics. Each of these is discussed in turn.
The first portion of this chapter subjected the access-related assumptions made in Chapter 4 to greater scrutiny. In particular, the analysis homed in on the nature and scope of access-related difficulties in the three case countries. For the reader’s reference, I sum up these empirical and qualitative conclusions below in a summary chart. Recall that I provided little if any quantitative evidence as to the precise extent of information and knowledge obstacles in the case countries (i.e. it was generally qualitative and anecdotal evidence that was presented). For this reason, the empirical validity of the assumptions relating to information and knowledge is noted as “uncertain” in the chart.

**Figure 5.6: Summary chart: Empirical validity of access related assumptions in Mexico, Brazil and Uganda**

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Empirical validity for Mexico</th>
<th>Empirical validity for Brazil</th>
<th>Empirical validity for Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot sizes are sufficient to trade one contract on the given futures exchange</td>
<td>Valid for no more than 1% of coffee farmers</td>
<td>Valid for no more than 71% of farmers, but likely fewer</td>
<td>Valid for no more than 3% of farmers</td>
</tr>
<tr>
<td>Yields are constant</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>There are no transaction costs</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Farmers have full information about the coffee and futures market</td>
<td>Uncertain. Likely invalid for the majority of farmers</td>
<td>Uncertain. Likely invalid for most small farmers</td>
<td>Uncertain. Likely invalid for the majority of farmers</td>
</tr>
<tr>
<td>Farmers have sufficient knowledge and skills to effectively trade in futures</td>
<td>Uncertain. Likely invalid for the majority of farmers</td>
<td>Uncertain. Likely invalid for most small farmers</td>
<td>Uncertain. Likely invalid for the majority of farmers</td>
</tr>
</tbody>
</table>

While the terrain of access difficulties varies across the three case countries, in all of them it is likely that successfully facilitating small farmer access to futures markets will require large amounts of time, energy and financing. This is for several reasons.
First, the access ‘problem’ has many dimensions, including: small farm sizes and output levels, yield risk, costs, information and knowledge. Moreover, each dimension contains within it myriad contributing factors. For example, yield risk for Ugandan farmers is not caused by only one factor. Yields vary for many reasons, including coffee wilt disease, problems acquiring new production technologies, and the weather. Each of these contributors to yield risk might require different policy approaches and significant financing in order that they are addressed effectively.

Second, the access problems are very widespread. In Mexico and Uganda, almost all coffee farmers are likely constrained by one or more of these obstacles. Even in Brazil where farmers tend to be wealthier and larger by comparison, a broad swath of the coffee farming population, small producers in particular, is similarly constrained. ‘Fixing’ access problems is not a matter of bringing a few small producers into the fold. It will likely be a massive undertaking, incorporating many tens of thousands of farmers in each country case, that will require substantial outlays of time and money.

The second half of the chapter, comprising the last two sections, discussed in various ways the consequences of futures market exclusion for the well being of small farmers. Exclusion prevents producers from reaping the benefits of hedging (what benefits there are—see Chapter 4). The potential negative impact of exclusion on well being is not tempered by the ability of small producers to watch and act upon prices discovered in futures markets because future prices are poor predictors of subsequent cash prices. Further, given the nature and scope of the access problem, futures markets advocates are in fact recommending income security arrangements that fail to help those who need help most. Instead, futures market advocates risk recommending policies that help those who
need help least. In addition, futures hedging may, even if access problems are somehow remedied, serve to worsen the distribution of income both among farmers and among actors along the GCCC.

Taken together, the chapter suggests the following to policymakers:

1. Facilitating access to futures markets for small coffee producers is a big undertaking. Policymakers, international organizations, non-profits and donors should be aware that access problems are multidimensional, widespread and not suggestive of quick, cheap or easy fixes.

2. If derivatives-based arrangements are given policy priority in the developing country coffee context, to the exclusion or marginalization of other income security alternatives, access problems must be effectively addressed. The price discovery mechanism alone will not necessarily improve farmer welfare, suggesting that access is crucial for farmers to reap those income benefits available via futures trading. If access problems are not addressed, this arrangement promises to help those who need help least, while withholding assistance from those who need it most. Further, the relative income position of small farmers relative to both larger farmers and other actors along the GCCC may deteriorate due to their inability to hedge.

3. If derivatives-based arrangements are given policy priority in the agricultural context, to the exclusion or marginalization of other income security alternatives, small farmers may see their relative income position deteriorate even if they are able to access futures markets for hedging purposes.

These conclusions again raise important policy questions. Given the sheer size of the undertaking, should limited time, energy and resources be directed towards fixing
small farmer access problems? Can these problems be addressed in a sufficiently widespread, timely and effective manner so as to shelter small farmers from the potential negative impact on their well-being that exclusion portends? If access difficulties are somehow remedied, what other programs will have to be put in place to ensure that the relative income position of small farmers does not continue to deteriorate? My evidence suggests that such questions are important and deserve close attention.

Already, some policymakers, national governments and international organizations have answered in the affirmative to the first question. As I write, innovative new programs to facilitate futures market intermediation are being implemented and put to the test. The next chapter describes and analyzes futures market intermediaries, focusing upon their success in overcoming the access difficulties that confront small coffee farmers.
CHAPTER SIX
Futures market intermediaries and income security alternatives

“No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable. It is but equity, besides, that they who feed, cloathe and lodge the whole body of the people, should have such a share of the produce of their own labor as to be themselves tolerably well fed, clothed and lodged.”
-Adam Smith87

“…it is not surprising that a lack of price risk management is one of the foremost reasons why poor farmers stay poor.”
-Rabobank International88

Introduction

Here begins the last part of this three part investigation of futures markets and coffee farmer income security. Having discussed the contributions of futures markets to remedying the producer income problem and the access problems that prevent small farmers from using them, this chapter is framed more concretely as a policy discussion.

Recall from Chapter 2 that this chapter is framed by two questions: Is ‘fixing’ access problems by erecting futures market intermediaries worth the time, energy and resources of those actors involved in such efforts? And, what alternative arrangements are available that may better address the producer income problem and better incorporate small producers? I address these questions in the sections that follow utilizing both

87 Smith 2000 (1776), 90.
quantitative data from various sources, qualitative data from various other researchers and theoretical analyses.

The first part of the chapter discusses and explores efforts at futures market intermediation in the three case countries. The intermediaries are described, and then subjected to the evaluative criteria that I have utilized throughout: the quality of the income security service they provide and their successes in serving small producers. As will be argued, it is far from clear that continued efforts to facilitate futures market intermediation are warranted at the present time.

The second part of the chapter moves on to analyze several income security alternatives available to coffee policymakers. I examine supply management in Mexico, alternative crop diversification in Brazil and Fairtrade in Uganda. The analysis is not intended to be comprehensive. Rather, I illustrate the usefulness for policymakers of sorting through and exploring various alternatives with the evaluative criterion that I have used to examine futures markets. From an income security perspective, supply management performs better than futures markets in Mexico. From the perspective of small coffee producers, the Brazilian government’s program to stimulate alternative crop diversification in the northeast region of the country promises significant benefits but these benefits have not yet materialized for small coffee producers. From both an income security and small producer perspective, Fairtrade in Uganda performs well in the former context and relatively poorly in the latter. Taken together, these brief examinations suggest that there are income security alternatives to futures markets that provide a higher quality service and that more successfully cater to the needs of smallholders.
The first section below takes up the issue of futures market intermediation. I then proceed to discuss income security alternatives for smallholders. The third and last section concludes with summary remarks and implications for policy.

**Futures market intermediaries**

That futures markets exclude small and even medium sized farmers has not gone unnoticed. Over the past decade, and even earlier in the case of Brazil, institutions have been erected to *intermediate* between farmers and futures markets. Such institutions aim to bridge access problems to futures market participation encountered by smallholders, or otherwise deliver market-based price insurance to them. In Mexico, both the federal government and farmer cooperatives are engaged as derivatives market intermediaries. In Brazil, the federal government and private investors have devised two different potential means of addressing access difficulties. And, in Uganda, both farmer associations and a local bank are filling similar roles.

In terms of policy, and as was the case with access obstacles in the previous chapter, a kind of false optimism prevails among many researchers evaluating futures market intermediaries. By my reading, not once has a researcher from the ITF, the CRMG, UNCTAD, the FAO or the IISD questioned whether or not futures market intermediation should be on policymakers’ agendas at all. This question is important. Is facilitating futures market intermediation a good use of the limited time, energy and resources of those involved in such efforts? To ignore this question is to implicitly endorse such a policy agenda. The evidence I marshal below suggests, to the contrary, that policymakers might fruitfully pursue altogether different policy options.
This section discusses these new institutions as follows. First, I provide brief descriptions of the intermediation efforts ongoing in each of the countries. Second, and related to the previous chapter’s discussion of access, I address two related points: the degree to which the intermediaries include small farmers (the population found to be most in need of assistance), and the extent to which the intermediaries themselves encounter the same access-related obstacles as small farmers. Last, and where appropriate, I raise questions and concerns related to the operation and structure of various intermediaries insofar as they potentially impact the quality of the income security service that is provided.

**Futures market intermediaries in Mexico**

Beginning in Mexico, at least two distinct institutional solutions to derivatives market access problems have been developed. The first involves farmer cooperatives and the second a government agency. Each are discussed in turn.

**Farmer cooperatives as intermediaries**

First, marketing cooperatives in Mexico often guarantee coffee farmers a minimum price for their crop. In this way the cooperative provides a service to its members that approximates the service offered by futures markets, with the risk of volatile or low coffee prices being transferred from the farmer to the cooperative. For example, the *Union Regional de Pequenos Productores de Café Forestak y de Agroindustrias de la Zona de Huatusco, Veracruz* is a cooperative union with almost 2,000 members (it also markets the coffee of an additional 2,000 non-member farmers). The average member farm size is 2.3 hectares, and members are required to market at least 80% of their crop through the Union (i.e. sell it to the Union for further processing and export).
Members have several different options when marketing their crop. The most popular is the *anticipo*, in which farmers deliver their crop to the Union after harvest and receive a portion (usually 60-70%) of the final expected value of the coffee. After all of the coffee is sold by the Union several months later, the farmer receives an additional payment equal to the difference between *anticipo* price and the final price if the latter is larger. The ITF notes that, “This system exposes the Union to significant price risk. If the final price turns out to be lower than the first payment (the anticipo), the Union stands to lose as it cannot recover money from the farmers (ITF 2002, 21).” Of course, the Union could simply pay out a smaller initial *anticipo*, the level of which would reflect the risk of prices falling until final sales are made. However, in doing so the Union risks losing its business especially when coffee prices are very low. “A smaller *anticipo* may encourage farmers to market their coffee elsewhere, or, even worse, be small enough that farmers will decide not to harvest their crop at all (ITF 2002, 21).”

On the one hand, such a payment system shifts the risk that prices will fall from the time of harvest through the subsequent marketing period from the producer to the cooperative itself. Indeed, the cooperative is essentially giving producers a put option—farmers do not bear the risk of prices falling below the *anticipo* price, but they are able to take advantages of rising prices (see Chapter 3 for an explanation of options). On the other hand, Chapter 4 found that one of the foremost advantages of trading in futures was that farmers have some certainty of the price they will get for their crop before the harvest, such that the application of inputs and technologies as well as family expenditures over the pre-harvest period could be managed and capital rationing avoided. Thus, while the cooperative union above does indeed provide an important price risk
management service, preventing falling prices during the marketing period, it is not the same service that is provided by futures hedging.

Putting this point aside for the moment, from a market access perspective, such an arrangement appears ideal for the individual farmer. Size, cost, yield, information and knowledge obstacles are simply shifted from the farmer downstream along the commodity chain to an actor that is arguably more capable of effective derivatives market use—the Union deals in larger lot sizes, has larger revenues and is more creditworthy (i.e. can potentially finance various costs), and likely has superior means and expertise to effectively gather and utilize market information. So long as the cooperative is itself able to lay off its own risk via derivatives markets, thereby ensuring the organization’s financial viability, the farmer will gain at least some of the income benefits of derivatives trading (depending on how the cooperative structures and times its price guarantees).

The only potential obstacle that remains for the individual farmer is the cost of joining such a cooperative.

**Government agencies as intermediaries**

The price guarantees offered to many Mexican coffee farmers by cooperative associations are complemented by an ongoing governmental effort to more directly intermediate between farmers and derivatives markets. A government program called *Apoys y Servicios a la Comercialización Agropecuaria* (ASERCA) assists primary producers of all sorts via direct income support, financial and technical support for agricultural commercialization, and a relatively new program to facilitate farmer hedging of price risk via options markets. The new program, *la Subprograma de Apoyos para la Adquisición de Coberturas de Precios Agropecuarios* (la Subprograma), subsidizes the
purchase of put and call options by farmers, cooperatives and processors producing maize, wheat, sorghum, soybeans, cartamo (an oil seed), rice, cotton, livestock, porkmeat, orange juice, and coffee. The program first got started in 1996, with coffee options being available for subsidy by the late 1990s. The government pays for one half of the option premium, which is repaid only if the transaction is profitable. The options for coffee available to Mexican farmers through this program are options on the NYBOT coffee “C” (Arabica) futures contract. While ASERCA allows farmers to trade in options, not futures, its structure and operations are nonetheless illustrative of ongoing intermediation efforts (Mohan 2007 is a lovely discussion of some potential benefits for coffee farmers from options trading).

From the perspective of farmer access, ASERCA addresses many of the obstacles discussed above. The program subsidizes the costs of trading, provides information on the coffee and options markets, offers technical assistance on strategy and the like, and operates a brokerage account on behalf of participating farmers. That said, farm size and yield risk remain problematic, and even subsidized premiums may be too expensive for some producers. While there has been talk of ASERCA allowing farmers to buy ‘shares’ of an option, such that small farmers with smaller lot sizes could participate individually, the ITF notes that the “typical user” of the program is currently either a large individual producer or associations of small and mid-sized producers (2002: 36). That Mexican producer associations utilize ASERCA to purchase price insurance for their members seemingly represents an interesting phenomenon—double intermediation.

Indeed, farmer associations frequently face similar access obstacles to derivatives trading as do farmers themselves. In terms of broker transaction costs, the CRMG
recently remarked that fulfilling due diligence and “know your client” requirements “is more complicated for producer groups and cooperatives than for local banks.”

Additionally, and depending on the cooperative in question, technical expertise is still a large obstacle. The CRMG notes: “For intermediaries lacking basic business skills, the benefit of education about price risk management instruments will be marginal. Additionally, attempts to build risk management capacity in organizations that have more critical problems such as poor communications infrastructure, institutional instability, underdeveloped marketing/financial skills, and weak managerial authority are likely to be ineffective and inefficient (2005, 1).” The ITF’s work in Mexico also focused squarely on the need to improve the technical capacities of producer organizations themselves such that they may be able to hedge effectively (2002, 27-8). The fact that intermediaries might also need intermediaries to address access obstacles comes to the fore in the Ugandan case as well (more below). Absent such second tier intermediation, cooperatives may have a difficult time sustaining price guarantees to their members, especially during times of crisis.

While determining precisely how many small and medium sized producers are able to indirectly acquire some price risk management via their cooperative (or other producer association) was not possible here, I was able to estimate a breakdown of participation in the ASERCA program. ASERCA has available the lists of la Subprograma’s participants for 2004 and 2005 (ASERCA 2004; ASERCA 2005). Included in these records are the names of the participating individuals and/or entities, the product they were hedging the price of, the number of contracts purchased, and the quantity of the commodity hedged.

89 One also might wonder about the layers of cost associated with introducing more and more middle-men.
In the case of farmer cooperatives and groups, I have estimated the number of farmers represented by these organizations based upon the quantity of coffee hedged (provided by ASERCA), average yields for 2004-5\textsuperscript{90} and the average coffee farm size in Mexico.\textsuperscript{91}

It should also be noted that it is not certain that all individual participants are farmers, nor that all participating groups are farmer cooperatives or other farmer organizations. La Subprograma is also open to agribusinesses that can demonstrate that they purchase coffee from farmers and that that they are using hedging instruments in order to protect prices paid to farmers (ITF, 2002). It is possible, then, that processors, exporters or other middlemen may be participating in the program. However, I am assuming, for the purpose of my calculations, that all individuals and groups participating are individual farmers or farmer groups. This can only bias the results in favor of presenting derivatives markets as more inclusive (again, to give derivatives markets the benefit of the doubt).

The data suggests that, of Mexico’s some 282,500 coffee farmers, only 0.03\% (or 3 out of every 10,000) participated in the program in 2004. In 2005, the figure increased slightly, with 0.4\% of coffee farmers participating in the program in 2005 (or 4 out of every thousand). By any measure these are very low participation levels.

The Mexican case illustrates not only how intermediaries may bridge access problems (e.g. through cost subsidization, opening up brokerage accounts and providing technical assistance, or indirectly via price guarantees to members of cooperatives), but it

\textsuperscript{90} From the FAO. Average yield for 2004: 3.931 metric tons/hectare. Average yield for 2005: 3.772 metric tons/hectare. One metric ton=1,000 kilograms. One hectare=10,000 meters\textsuperscript{2} or 2.47 acres.

\textsuperscript{91} From ITF, 2002. Average farm size is 2.69 hectares.
also illustrates how the access obstacles that confront individual farmers are sometimes reproduced at the level of the intermediary. In Mexico, coffee cooperatives often face the same access difficulties as do individual farmers. In instances such as these, two intermediaries, or perhaps even more, might be required to effectively link farmers to derivatives markets. From a policy perspective, this suggests that efforts to facilitate futures market intermediation are likely to be ongoing commitments that require frequent monitoring, experimenting and reconfiguration. For example, the ITF, as noted above, has had to significantly widen its search for appropriate intermediaries and rethink the role of cooperatives in response to difficulties on the ground in training cooperative leadership.

Further, low participation rates in ASERCA’s Subprograma suggest that intermediaries may be almost as exclusive as derivatives markets themselves. While erected ostensibly to provide farmers with much needed risk management services, la Subprograma fails to deliver price insurance to that population of Mexican coffee farmers that needs assistance most. Indeed, the mere existence of an intermediary does not ensure that smallholder communities are able to participate. Specific policy attention is required in order to create intermediaries that place a priority on assisting small producers.

**Futures market intermediaries in Brazil**

Similar to Mexico’s ASERCA program, the Brazilian government has also intermediated between farmers and options markets in the past. Further, an innovative Brazilian financial product, the Cedula de Producto Rural (CPR) combines price risk management with a debt instrument in a model of futures market intermediation that the World Bank (among others) is very excited about. These are each discussed in turn.
**Government intermediation**

The World Bank briefly describes a program developed by the Brazilian government during the coffee crisis. “According to BM&F management, the government has decided to support coffee producers in light of the falling coffee prices by selling coffee put options dated March 2004 (World Bank 2004, 206).” Contributing authors to a 2005 World Bank book on commodity markets note that the Brazilian government “has been auctioning put options to farmers at well below fair value; these options are exercisable as sales of coffee to the government (Baffes et. al. in Aksoy and Beghin 2005, 306).”

Leao de Sousa and Pimentel describe the program as follows: “[T]he government takes “short positions” – and, therefore, assumes the obligation to buy the production at the target price. The buyers, in turn, are the farmers; while government has the “obligation” to buy, farmers get the “right” to sell their production to the government at the target price, if market price is not more attractive at the period of delivery. For that, farmers pay a premium established by electronic auctions at the Commodity Exchanges throughout the country, which guarantees the required transparency (2005, 5).”

The 2004 World Bank report makes note of the fact that small producers were excluded from the program, as they were too small to meet the lot specifications in the options contracts (206). That said, the program seems to have addressed other access obstacles, namely difficulties in finding a broker and the costs of options premiums. Baffes, in the statement above, indicates that the options were sold at below market value, meaning that the government subsidized their purchase by farmers. Leao de Sousa, however, writes that the premiums were established by electronic auction, indicating that premiums may not have actually been subsidized.
A recent proposal from derivatives expert Randall Dodd bears some resemblance to the Brazilian government’s program. Calling the plan “Puts for People First”, Dodd suggests that governments issue non-transferrable put options to farmers with a strike price equal to that day’s market price. The options would expire about two months after the harvest, and the output level specified in the contract would be based upon past or expected future yields (Dodd 2007, 26).

Dodd’s suggestion also fundamentally differs from the Brazilian program in several important respects. The author suggests that the provision of put options could be accompanied by environmental requirements, such as requiring that producers work on soil conservancy as a condition of receiving the option. Also very interesting is Dodd’s suggestion that governments could issue the options based on current market prices for subsequent crop years (not just the current one) “so that producers could invest in their farming activity based on some assurance of future crop prices” (Dodd 2007, 26).

On the one hand, such a program could conceivably address many of the concerns that I have raised throughout. Dodd’s program, if executed properly, could be expected to address the following access and quality issues: the costs of futures trading, problems finding a broker, farm size, and the short-term limitations of derivatives in terms of certainty. That said, such a program will not necessarily ensure an adequate or stable income for producers, as this depends in a large part upon the level and movement of market prices. Further, farmers would still be exposed to significant yield risk (i.e. the risk that their actual output is larger than their hedged output), and thus price risk on the potentially unhedged quantity. In addition, making good use of the put option (i.e.

92 Non-transferrable so a secondary market will not emerge.
exercising it appropriately) likely requires access to market information and knowledge of the instruments and how they work.

All of this is to say that policymakers must look carefully at the capacity of each program and intermediary to address a plethora of access and quality-related issues. While some of these issues may be given policy priority over others, it is likely that no single intermediary or government program will be sufficient to address all of the issues I have raised thus far.

**Intermediation via financial product innovation**

A different sort of intermediation is also ongoing in Brazil. In 1994, rural agricultural bonds—las Cédulas de Producto Rural (CPR)—were introduced in Brazil with the primary goal of ensuring that farmers had the financing and inputs required for production (Leao de Sousa and Pimentel 2005, 5). The CPR may be settled in 3 different ways, with each method of settlement implying a different kind of relationship to coffee prices.

The “physical” CPR works as follows: “The producer receives cash (or inputs) upon the issuance and selling of the bond for their physical product and has the obligation of delivering an agreed amount of rural production at an agreed location and future date … In this way, the physical CPR provides crop financing for the production of the crop - or livestock – and also manages the producer’s price risk by linking the debt to the physical product (World Bank 2005a, 14).” In other words, debts are repaid in actual coffee (or whatever the crop might be) such that if prices fall farmers are still able to repay. This is indeed a form of price insurance, as the value of the debt decreases in tandem with coffee
This system does have a big drawback, however: farmers are reluctant to repay the bond when coffee prices are on the rise, as their coffee is valued higher on the open market than it is for CPR repayment (i.e. total value of the coffee on the open market is greater than the amount of credit that was extended initially when the CPR was issued).

The “cash settled” or “financial” CPR does not appear to offer price protection for farmers at all, and is in fact a source of new risk. As the prospect of future delivery discouraged many investors from buying the physically settled bonds, cash settlement was seen as a way of making the CPR market more liquid. At the time the bond is issued, a price is determined at which the contract will be settled after harvest. Depending on whether coffee prices rise or fall between the time of the bond issue and repayment, the farmer or association will gain or lose, respectively. The World Bank notes that “this new contract is more advantageous to the buyers as it leaves market price risk of the underlying commodity with the supplier” (2005a, 15). Leao de Sousa and Pimentel suggest that the cash settled CPR is more of a tool for speculation than for risk management, as farmers tend to prefer the cash settled CPR when they think that coffee prices will rise in the future (2005, 11).

The “indexed to futures” CPR is the final type of bond. “Contract settlement is based on a local or foreign futures market reference price or the price calculated by a reliable source, such as a university. In this case, the settlement is based on the amount of production established on the bond, multiplied by the agreed upon reference price at the

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93 Commodity linked bonds are increasingly being advocated to developing country governments for this very reason. If debt repayment is linked to commodity prices, commodity dependent governments may avoid default during times of falling commodity prices. See, for example, Occhiolini in Claessens and Duncan 1993.
time of settlement. The indexed CPR, like the physical CPR, brings benefit to the seller because it transfers the price risk to the buyer while at the same time allows the buyer of the CPR to settle the contract financially, the key element of the Financial CPR” (World Bank 2005a, 15). Indeed, the lower the settlement price the lower the amount that issuers have to repay, a system that reduces the likelihood of producer default during times of falling prices.

As was the case with the minimum price guarantees offered by cooperatives in Mexico, in Brazil the nature of the intermediation alters the specific price risk management service that is being provided. In the case of the CPR, price risk management is linked to debt repayment, with income benefits accruing to farmers indirectly. The ability to repay debts may indirectly smooth consumption by opening channels for new extensions of credit during future income shocks. Further, the ability to obtain pre-harvest financing and the certainty of repayment may allow producers to make investments in production technologies that increase future income. That said, issuing a CPR still leaves farmers exposed to the potentially harmful effects of price-induced income shocks in terms of lower consumption, malnutrition and reduced expenditures on education and health.

Moreover, the cash settled CPR isn’t a risk management instrument at all—it is a debt instrument that exposes issuers (producers) to price risk from the time of issuance to the time of settlement. Unfortunately, this particular CPR is currently the most popular. Of the almost 130,000 CPRs issued between 1994 and 2004, almost 70% were of the cash-settled variety, only 1-2% were indexed to futures, while roughly 25% are physically settled (Leao de Sousa and Pimentel 2005, 11). A minority of bonds issued
were embedded with any sort of price insurance, while the majority serve to insure investors with producers themselves bearing added price risk.

One might raise further concerns about the nature of the model employed here by the Brazilian government—the linking of price risk management to producer credit. While on the one hand, credit (especially short-term, pre-harvest financing) is usually crucial for sustaining a farming enterprise (see Panikar 1963 for a wonderful exposition of this position), on the other hand debt can sometimes be a source of financial hardship and insecurity. Oxfam’s 2005 report *The Coffee Crisis Continues* clearly describes the manner in which debt acts as a double-edged sword particularly for small coffee producers: “Many small-scale farmers entered into the coffee crisis shouldering significant debt at above market rates. Those who survived through the lowest prices continue to bear the heavy burden of this obligation. Unable to refinance debt taken on before and during the crisis, many farmers risk losing their land and lack pre-harvest working capital to invest in their crop – all despite higher coffee prices (2005, 30).” Oxfam points crucially to several factors that help to determine whether extension of credit to coffee farmers will broadly be beneficial or harmful—lending terms, existing debt levels and prospects for repayment. While innovative means of making financial markets work for small coffee farmers are exceptionally important, credit is not a cure-all for the producer income problem.

In any case, it is doubtful that the CPR is reaching small Brazilian producers. The World Bank notes that, “The instrument has become a relevant financing and commercialization mechanism for producers of various sizes in Brazil, especially for medium and large-sized producers” (World Bank 2005a, 15). It goes on: “Tracking the
total number of operations by value of CPR contracts, the value from US$3,000 to
US$10,000 is found to be most commonly used, which is typically a sufficient fund to
finance medium-size producers” (World Bank 2005a, 15, f.n. 6). Like the futures
markets themselves, the Brazilian debt-linked price risk management instrument appears
to bypass those who need price risk management most.

Futures market intermediation in Uganda

In Uganda, the World Bank’s CRMG along with the ITF (the two groups have many
of the same personnel and programs are coordinated to some degree) have focused upon
two different intermediaries, both of which have delved into derivatives markets in a very
limited fashion: a local bank and an umbrella farmer cooperative. These are each
discussed in turn.

Local banks as intermediaries

Centenary Rural Development Bank recently worked with the ITF on incorporating
price risk management into its lending operations, an idea not unlike the Brazilian CPR.
The ITF and CRMG generally have high hopes for the use of local banks as
intermediaries across the developing world, as opposed to other actors along the GCCC
like cooperatives, traders and exporters.

According to a 2005 CRMG report on the “lessons learned” in its price risk
management work thus far, banks have several advantages over other actors. Banks have
more technical expertise, are usually sufficiently financially “sophisticated”, have
sufficient communications channels to work with brokers in other countries, can achieve
economies of scale in certain costs (especially information costs) and can increase
lending (or reduce the costs of lending) via its facilitation of hedging. Further, banks can
potentially extend credit to producers to finance initial margin requirements and subsequent margin calls (see ITF 2002 for discussion of this possibility in Mexico; the ITF has also commented favorably on such a system operating in El Salvador—see Tiffen and Fernandez 2005).

Perhaps most importantly, banks have the proper “commercial incentive” to offer price risk management services (CRMG 2005, 2). In other words, the incentives of banks are such that they are willing, without any further inducement, to provide price risk insurance to farmers (for a fee of course) because price insurance directly benefits the bank itself in terms of reducing the risk of farmer loan default. Other actors along the GCCC that are positioned sufficiently close to producers either have the wrong incentive (e.g. exporters who tend to go long in futures as opposed to farmers’ needs to go short) or no incentive at all (e.g. domestic traders who are only marginally exposed to price risk over the short time that they actually hold coffee would need some financial inducement to hedge at all or to pass on savings from futures hedging to producers). Although marketing cooperatives might have a similar commercial incentive (as in the case of the Mexican cooperative union that was itself exposed to price risk), their expertise, communications infrastructure and unfamiliarity with brokers in developed countries makes them generally less viable in this context.

While these various World Bank organs seem very keen on discouraging developing country governments from providing such financial inducements, others have suggested that subsidies may be absolutely necessary to bridge the abyss between farmers and futures markets. Rabobank International, a private firm that has worked extensively with the Government of the Netherlands on farmer price risk management, states:

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Presumably, it was considerations concerning entry barriers and economies of scale which led the World Bank in the direction of sold-on price insurance rather than first-hand futures trading when it came to smallholder producers. But whether even this model can be operationalized without subsidies both to international traders and credit institutions is unclear. Certainly the transaction costs of such schemes will be high and there seems no incentive for international traders or credit institutions to assume them for third parties without a subsidy (in Gibbon 2005, 17).

Putting such fiscal matters aside for a moment, Centenary Rural Development Bank in Uganda did not conform to the broader expectations of the CRMG regarding local banks as intermediaries. In fact, the bank fell prey to one of the very same obstacles that confronts producers trying to access futures markets directly. “After an extensive capacity building effort, implementation was frustrated by a high level managerial decision at the bank that the account-opening requirements of the providers (in particular, request for copies of passports) were too stringent for Board members to comply (CRMG 2005, 11-12—work summary piece).” “Due diligence” and “know-your-client” requirements torpedoed the CRMG’s work with the local bank.

Just as the World Bank noted in regard to producer cooperatives, UNCTAD (2002) remarks that local banks in developing countries may lack the skills and expertise necessary to offer price insurance to their clients; and, the Ugandan case illustrates that additional access obstacles confront local banks as well. As was the case in Mexico, access problems are sometimes reproduced at the level of the intermediary, perhaps indicating the need for double (or triple) intermediation. To reiterate, that intermediaries might also require intermediation in order to effectively use futures markets is a serious policy concern. It is likely that fostering each layer of intermediation would require significant time, energy and resources on the part of governments and private actors.
Intermediation by an umbrella cooperative

Union Export Services Ltd. (UNEX), an umbrella organization of Ugandan farmer cooperatives created to facilitate coffee exports, also delved into derivatives trading on behalf of its membership. In 2002 UNEX successfully purchased an “over-the-counter NYBOT-based put option” (CRMG 2005, 25—work sum piece). The CRMG reports that this initial transaction was successful but that, three years later, it had yet to be “replicated”.

Among the issues that frustrated the CRMG’s plans was the fact that “UNEX [faced] strong demands from its farmers for more training on the subject of price risk management… The original concept was to have UNEX purchase the contract on behalf of farmers who would share in the costs and benefits. That idea has been very difficult to replicate, because of the high capacity building needs for farmers, who, when directly involved, request more and more training (2005, 25—work sum piece).” Recognizing the problem, UNEX has decided to “hedge its own exposures, and pass the benefits to farmers back indirectly” (CRMG 2005, 25). As of 2005, this reformulated plan had yet to be put in place.

A very interesting paradox emerges here. On the one hand, UNEX’s desire to incorporate its farmer-members into the mechanics of the hedging process might be applauded on governance grounds—in democratic fashion, members of UNEX were encouraged to and did participate in the cooperative’s hedging program. On the other hand, farmer participation confounded the actual hedging process due to the high levels of education and training that the farmers required. Raynolds identifies an almost
identical issue in the context of Latin American cooperatives involved in Fair Trade coffee production:

Most activities related to Fair Trade certification and marketing are handled by the cooperative leadership and not by producers. Cooperative management often fosters this lack of knowledge on the part of the producers through the pursuit of management efficiency, sometimes at the expense of democratic participation. It is simply easier for cooperative leaders to make decisions concerning production and marketing than to communicate and discuss different options and their impacts with the members (2005, 188).

The highly technical nature of futures hedging, combined with rapidly changing futures prices, makes this situation arguably more dire in the case of cooperatives looking to utilize futures markets. Writing about Mexico, the ITF states: “As noted, the pilot relies on a local organization to aggregate smallholder demand for price insurance and to provide for decisions about insurance purchases in a timely way. Because prices move constantly, decisions concerning market timing must be quickly made” (2002, 18, emphasis added).

In this manner, the quest to obtain income security via futures markets potentially comes into conflict with democratic aspirations in cooperative organizations, a conflict that is created via the process of intermediation. The previous chapter noted how futures price volatility required constant and rapid decision-making by producers in the hedging context. While such decisions are difficult simply due to the speed with which futures markets move, they are made more difficult in situations where potential hedgers have insufficient knowledge of futures trading. Cooperatives that seek to bridge this knowledge gap and deliver the gains from hedging to farmers by taking on the hedging activities themselves risk excluding farmers from decision-making processes.
Cooperatives that encourage farmer participation in decision-making, in democratic fashion, risk losing the benefits of hedging altogether. The experience of UNEX is an excellent example of this conundrum.

**Summary and significance**

While brief, this discussion of intermediation efforts in the three countries has raised several important points and contains a host of different policy implications. Below, I enumerate these conclusions and discuss the policy implications thereof.

First, in each of the three case countries qualitatively different sorts of intermediaries have arisen, testifying to the different landscapes of finance and coffee production and organization in each case. Across the three countries intermediaries are taking very different forms—producer cooperatives and marketing associations, national governments, local banks, financial innovators and private investors are all variously involved in intermediation efforts. This compellingly suggest that, despite the World Bank’s enthusiasm for local banks, there is not likely to be a “one-size-fits-all” solution to futures market access problems. To be fair, researchers at other institutions also view local banks as holding great promise in the futures market intermediation context (e.g. Rutten and Youssef 2007).

Second, the intermediaries surveyed were able to incorporate small producers to varying degrees. The Mexican cooperative union, for example, is comprised solely of smallholders, while Mexico’s ASERCA program seems quite exclusive of small producers at the current time. Like ASERCA, both Brazil’s put option and CPR programs failed to systematically incorporate small producers, if at all. And, while UNEX’s membership counts almost all smallholders among its ranks, the hedging
program has not continued beyond a single initial transaction. Centenary Rural Development Bank in Uganda did not complete a single transaction.

In this manner, certain sorts of intermediaries reproduce the access/exclusion problem noted previously—many do not assist those who need income security the most, namely smallholder producers, with the corresponding negative implications for farmer well-being (see Chapter 5). This implies that policymakers will have to pay explicit attention to the capacity of intermediaries to address the needs of smallholders. In some cases, like Mexico’s ASERCA program, medium-sized producers are also excluded from participation in the intermediary.

Policy recommendations as to the importance of intermediation do not sufficiently emphasize this point. For example, UNCTAD explicitly discusses ASERCA as follows, implying that Mexico’s is an example worth replicating: “Mexico’s ASERCA, while not having the same resources [as US agencies], is another example of a Government setting up an institution to advocate market-based risk management instruments. But developing countries, where farmers are by no means faced by lesser risks than farmers in the United States, have by and large neglected to follow these examples (2002, 36).” My discussion above suggests that developing country policymakers, if they place a priority on assisting small coffee farmers, would do well to steer clear of the ASERCA model as it currently operates.

Third, the access obstacles that confront small and mid-sized coffee producers are often reproduced at the level of the intermediary. The Mexican cooperative union faced difficulties relating to technical capacity and expertise, as did the Ugandan bank and cooperative. The Mexican and Brazilian governments, while assisting producers with
cost- and knowledge-related obstacles, failed to address the problem of small farm size and output levels. Policymakers should be aware that intermediation does not by itself solve the access problems discussed in the previous chapter. Some intermediaries, once established, will likely require similar assistance as would individual farmers accessing futures markets directly: assistance aggregating smaller lots, assistance managing yield risks, assistance paying brokerage and other costs, assistance in gathering and processing necessary information, and assistance in devising and implementing risk management strategies of various types.

While the ITF’s and CRMG’s experimental work has highlighted the frequency with which such issues have arisen in practice, many researchers craft policy recommendations that overlook the matter entirely. For example, Rutten and Youssef (2007) make a variety of generic policy recommendations at the end of their recent discussion of market-based price risk management for coffee farmers. Their recommendations to farmers associations include, for example, the following advice: “Farmers’ associations that are actively involved in providing inputs or credit, or in the marketing or processing of their members’ produce, should evaluate their own exposure to price risk, and consider appropriate measures to manage it (Rutten and Youssef 2007, 33).” Another recommendation to local banks is formulated as follows: “Local banks should use their access to the international banking system to provide a pass-through to the international risk management markets for those in their countries who, for various reasons, are unable to access these markets directly (Rutten and Youssef 2007, 34).”

While perhaps a good idea, such generic recommendations direct attention away from the fact that many farmer associations have insufficient technical capacity (i.e. 306
knowledge and skills) to make such assessments, and also often lack the informational resources required to weigh various risk management alternatives. In the case of local banks, the authors assume that local banks actually have access to the international banking system, which is in some cases not accurate (see the discussion above about Centenary Bank in Uganda). The danger in such a presentation perhaps lies in the fact that intermediaries like farmers associations are viewed as a rather simple, quick and comprehensive fix to the access problems that confront individual farmers. My analysis suggests that there is good reason to believe that this is not the case.

Fourth, the nature of the intermediation can change the quality of the income security service provided. Nowhere is this perhaps more clear than in the case of the Brazilian CPR. To start, the integration of price risk management into a rural bond decisively changed the nature of the service provided—price risk management and raising capital are joined into a single instrument. Further, depending on the settlement mechanism the CPR can serve to hedge (reduce) a farmer’s exposure to price risk, can limit the financial impact of price risk on loan repayment, or can be a speculative vehicle. As another example, Dodd’s “Puts for People First” program could potentially enhance the risk management service that futures and options markets otherwise can provide—the certainty gains from hedging (see Chapter 4) could be extended several years forward depending on how a given government decides to issue the non-transferrable put options.

Policymakers should be aware that intermediation itself may alter the extent and type of income support that futures markets provide. While my analysis in Chapter 4 provides a reasonable picture of the quality of futures hedging by itself, intermediation may enhance the quality of the income security service provided (like Dodd’s proposal), or it
may diminish the income support provided to producers (like the cash-settled Brazilian CPR). Intermediaries do not merely serve to bridge access problems, they can also alter the nature (quality) of the service futures markets provide.

Fifth, I would like to point out that in some countries, like Brazil, efforts to establish effective futures market intermediaries have been ongoing for close to 15 years. The World Bank’s ITF has been active in this context for at least a decade, with World Bank researchers generally making policy recommendations about futures market intermediation as far back as 15 years ago. While I understand that institution building is a lengthy endeavor and is largely characterized by a process of trial and error, the urgency of the plight of coffee smallholders raises serious concerns about timing—there may be a mismatch between the nature of the producer income problem and the long timeframe involved in developing a derivatives-based solution thereto.

This is an additional point that I have yet to see raised by agricultural development researchers in the derivatives context. Not only have many small coffee farmers yet to recover from the 1998-2002 coffee crisis (see Daniels and Petchers 2005), but the global coffee farming community may today be sitting on the eve of yet another prolonged period of volatility and low prices as the global economy sinks further into recession. The ICO’s December 2008 “Coffee Market Report” confirms a general downward trend in coffee prices, a trend most marked for Robustas where prices decreased by more than 9% between November and December 2008.\textsuperscript{94} Downward demand pressures are combining with a relatively strong US dollar and expanded production by some

producing countries (namely, Vietnam, India and Ethiopia) to put downward pressure on coffee prices.

Given the precarious situation of small coffee farmers and the possibility of yet another coffee crisis, the relatively long timeframe involved in developing effective intermediaries and ensuring farmer use thereof is highly problematic. In 2003 Jacques Chirac (then President of France) stated: “There is on the question of commodities a sort of conspiracy of silence. The solutions are not simple …But nothing justifies the present indifference” (in Mold 2006, 1). The timing mismatch that I identify here risks inadvertently feeding into this “conspiracy of silence”. While derivatives advocates do generally exhibit noteworthy and serious concern about the well being of small coffee farmers, current recommendations do not consider that something must be done quickly and that the current pace of implementation appears inadequate to address the matter promptly.

This is not to say that derivative-based solutions to the producer income problem should necessarily be abandoned. It does, however, imply that other shorter-term means of addressing the issue, if only temporary, should be actively explored and implemented. In short, some kind of action is required now because smallholders cannot afford to wait.

Last, the intermediary discussion raised several other interesting considerations relative to farmer income security. The Brazilian CPR program and the plans of Centenary Bank in Uganda both introduced a model of intermediation whereby price risk management is linked to extensions of agricultural credit. While many small farmers are indeed underserved by financial markets, it remains that debt is not always welfare-enhancing. In some cases, debt can introduce income insecurity as productive assets (like
land) are liquidated and consumption is reduced to service loans. Price risk management and the income security it affords farmers (even if limited) are important in welfare terms independent of linkages to credit/debt. An additional interesting point was also raised, related to governance. The experiences of UNEX in Uganda raised the possibility of a conflict between desires for democratic governance in cooperative associations and the rapid pace at which decisions must be made in order for hedging to be effective.

Having discussed futures market intermediaries, below I go on to discuss income security alternatives in the three case countries.

**Income security alternatives**

The previous sections and chapters tentatively raised the following policy question: Do derivatives-based solutions to the coffee producer income problem warrant the resources, time and energy of those public- and private-sector actors involved in such efforts? While many researchers imply in their work that the answer is ‘yes’, the evidence I have marshaled thus far has suggested many reasons to answer ‘no’. These reasons have ranged from concerns about the quality of the service futures hedging provides to the slow pace and relatively small successes of intermediation efforts, among many others. The answer may be an even more definitive ‘no’ if other, income security alternatives are isolated and found to be superior. And the answer may be a more definitive ‘yes’ if futures hedging, for all of its flaws, is found to be the best among various alternatives.

Farmers, farmer associations, non-profit organizations, national governments and international development organizations and other relevant actors all are limited in their
expenditure of resources, time and energy. This most basic of policy constraints suggests the crucial need to pick and choose among a variety of solutions. But how? I have argued throughout the investigation and implemented in my own analysis, two criterion that might be useful and important considerations for the picking and choosing:

1. The extent to which a given arrangement specifically addresses the needs and circumstances of small coffee producers.

2. The extent to which a given arrangement addresses each of the four dimensions of the producer income problem: stability, certainty, adequacy and (in)equality.

As it stands, futures markets as an income security arrangement fail rather completely on the first count, and do better, although not well, on the second. Today, futures markets are almost wholly exclusionary of small coffee producers. Instead, these markets are at best accessible to large, wealthy farmers with credit, assets and/or savings, access to timely and extensive information, knowledge of futures hedging, and the capability to reduce or absorb the impact of yield risk.

Further, the income security service provided by futures hedging is not easily deciphered. At the right time with the right strategy, the evidence suggests that these instruments can be used to stabilize and predict incomes, to raise incomes, and to improve the relative income position of coffee farmers. Yet the evidence suggests that it is just as likely that futures hedging will destabilize incomes, deliver a false sense of certainty about incomes, fail to make incomes adequate to the needs of farmers, and worsen the relative income position of coffee farmers relative to other actors.

What alternatives exist that may better address the income problem of small coffee producers? A comprehensive discussion of all possible alternatives and combinations
thereof is not possible here, nor is it necessarily useful. Instead, in the analysis that follows I briefly discuss a few alternatives, focusing specifically upon their successes in targeting small farming populations and the quality of the income security service provided by each. In this manner I again apply the evaluative criterion above and illustrate their utility in sorting through various policy recommendations and potential plans of action.

I discuss each alternative with reference to one of the three country cases: supply management in Mexico; alternative crop diversification in Brazil; and, Fairtrade coffee networks in Uganda. Chapter 2’s discussion of research methodology discusses the rationale behind these choices. Overall, the subsections below serve several purposes:

1. To illustrate that using the four dimensional producer income problem (i.e. income (in)security) as an analytical tool and evaluative criterion allows for the consideration of alternatives that are not currently in the development mainstream. Supply management, while often discounted on efficiency, moral and policy coherence grounds, actually performs quite well in income security terms in the Mexican case.

2. To illustrate the importance of focusing specifically on smallholders in formulating agricultural development policy. For example, the Brazilian government has taken many steps to diversify the Brazilian agricultural sector more generally, but has stopped short of targeting small coffee producers with these efforts. While diversification holds income security promise, and even though it has been an effective income security strategy for small producers elsewhere in the country, small coffee farmers remain almost entirely reliant upon coffee for cash income.
3. To illustrate that popular recommendations from more heterodox development researchers can fall prey to many of the same criticisms as do recommendations for futures markets from more orthodox development researchers. Fairtrade, while often considered a counter-hegemonic alternative to the contemporary global coffee trading system, falls prey to many of the same criticisms as does futures hedging. While the income security service provided by Fairtrade appears superior to that of futures markets, it is not unambiguously so. Further, Ugandan farmers confront similar access obstacles when attempting to participate in Fairtrade as they do in accessing futures markets.

4. To illustrate that any comprehensive, sustainable, long-term solution to the small coffee farmer income problem is likely to be multidimensional and piecemeal, to draw upon many different kinds of markets and institutions, and to require sustained and sizeable commitment and investment from national governments, international organizations, and other donors.

It should be noted that alternatives to manage coffee price risk are to some extent limited by the nature of the risk itself. Price risk is a “covariate” or “systemic” risk that tends to threaten entire communities and/or countries at the same time. This severely limits the ability of “informal” arrangements to provide support in times of crisis. Income support systems that rely on extended family, clan, tribe, professional associations and other private, social networks frequently fail in the face of covariate risk because most or all participants in the network are affected simultaneously by the given shock (see, e.g., Holzmann and Jorgenson 2000). Traditional insurance schemes also tend to fail in the face of systemic risk as multiple, simultaneous claims threaten the
financial solvency of such arrangements. In addition, I have extensively documented in previous chapters the dangers frequently posed to (small, poor) farmers and their families by “self-insurance” and “coping” techniques, such as reducing food intake and taking children out of school. For this reason these will not be considered here.

Below, I first address supply management during the ICA era in Mexico, focusing upon the income security service provided thereby. I then discuss alternative crop diversification in Brazil, focusing upon the accessibility of this arrangement for smallholders. Last I discuss Fairtrade networks in Uganda, focusing upon both the income security service provided and the accessibility of the arrangement for smallholders. In each subsection a general discussion of the arrangement in question is followed by a brief analysis of the workings of the arrangement in the given country case.

**Supply management in Mexico**

As documented extensively in Chapters 2 and 3, the International Coffee Agreement (ICA) and its national extensions (like marketing boards) have met with significant criticism from neoclassical economists and agricultural development researchers working for the World Bank, UNCTAD and the FAO, among other organizations. Criticism has generally centered upon three points: the inefficiencies of government managed coffee markets; the encroachment upon producer freedom that supply management entailed; and, the policy incoherence induced via supply management at a time when market liberalization was being advocated more generally by such researchers and institutions.

This dissertation has thus far taken a different path, instead utilizing producer income

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95 This is why, for example, flood insurance in the US is so heavily subsidized by government. Two problems arise for private providers: only people in flood zones buy insurance and when a flood hits huge proportions of the insured simultaneously make claims and deplete the pool of funds available to pay them.
security as a lens through which to view and adjudicate between different price risk management arrangements. In contrast to the rather negative assessments of supply management from critics, an income security lens yields a more positive appraisal. Using data from the ICA era in Mexico, below I discuss the income security gains for producers derived from this supply management scheme.

To start, there is a broad literature on the ICA that ranges from political discussions of its origins to technical discussions of the inefficiencies of its various provisions and parts (e.g. Bates 1997, Talbott 1997, Mshomba 2000, Akiyama et. al. 2001; Daviron and Ponte 2005; Daviron 2002; Ponte 2002; Gilbert 2005). Some of this work has analyzed the impact of coffee supply management during the ICA era upon world coffee prices. By and large, scholars agree that the ICA did indeed stabilize world coffee prices.

Akiyama, Tamassa and Varangis find that, “Overall, the quota system had a stabilizing effect on world coffee prices (1990 in Bates, 1997: 18).” Jorge Cardenas, Chairman of the World Coffee Conference, states in a 2001 speech: “International coffee prices have shown a fluctuation of more than 50 percent annually in recent years whereas during periods when the market was regulated prices fluctuated between 10-15 percent around their medium-term trend (2001: 2).” Gilbert, a notable exception in this context, contends that world coffee price volatility did not increase following the collapse of the ICA. However, he does note that while, by his measure, world price volatility stayed more or less constant, the elimination of state stabilization arrangements has meant that volatility is passed through to producers, rather than being absorbed by the state (Gilbert, 2005: 6).
However, as many ICA critics have noted, world coffee prices (export prices) are not a good indication of the prices coffee farmers actually received under the ICA. Marketing boards and the like frequently drove a wedge between export and farmgate prices in order to raise government revenue and fund development projects elsewhere. This implies that coffee farmers likely did not do as well in income terms as the studies mentioned above would suggest. Farmers would have received something less than the world price, and farmgate prices may not have been as stable as world prices if marketing boards adjusted them frequently to accommodate the government’s changing fiscal needs. This wedge was among the factors that led “a powerful grassroots movement of small coffee producers” to “mobilize against” the state-owned Mexican Coffee Institute (INMECAFE), hastening neoliberal reform (2001: 21).

Measuring the income security service provided to Mexican farmers via ICA thus requires attention to the actual prices that farmers received. Fortunately, the ICO records historical “coffee prices paid to growers” for all member countries, in some cases going back as early as the 1960s. Using this data from the ICO, historical average annual yield data from the FAO, and historical exchange rate and inflation data from the IMF (via the USDA), I have been able to estimate the income of a Mexican coffee farmer of average size for the years 1976-1989. For Mexico, ICO historical grower prices went back only until 1976 limiting the range of my calculations. The reader should note that I have stopped the calculations in 1989 because this is the last year that the ICA quota clauses were in effect. Although INMECAFE tried to maintain its support prices until 1993, its ability to do so was severely compromised given the sudden absence of international cooperation to restrict global supplies.
The graph below illustrates the real income (in 2007 pesos) of a producer of average size (2.7 hectares) during the ICA era.

By my estimation, real income for a Mexican Arabica producer with a farm of average size would have seen his income range from a peak of just over $115,000 pesos to a trough of just over $53,500 pesos in 1989. The average annual income over the 1976-1989 period is $75,420 pesos, and the coefficient of variation for the sample is roughly 29%.

Relative to the income earned from hedging and coffee sales during the 1998-2002 coffee crisis by a Mexican Arabica farmer of average size, the ICA and INMECAFE performed rather well. Using the data from Chapter 4, the following comparisons can be made. Recall that Rollover #2 was found to be the most profitable hedging strategy in the Mexican case. Yet, the average, real annual income for the average sized Mexican farmer from Chapter 4 using this strategy was only $51,757 pesos—this is over $23,000 pesos less than the average, real annual income of this same sized farmer during the

Figure 6.1
Real annual Mexican farmer income, 1976-1989
(2007 Mexican pesos)

real annual income
1976-1989 period. The ICA, along with INMECAFE, managed to maintain an average income over 45% higher than did coffee sales combined with the most profitable hedging strategy that I devised during the coffee crisis.

In terms of inter-seasonal income stability, only the plain annual and rollover annual hedges from Chapter 4 outperformed the income streams from the ICA era. The plain annual hedge produced income streams with a coefficient of variation of just over 22% during the coffee crisis and the annual rollover’s coefficient of variation was just over 26%, while the ICA generated streams with a 29% coefficient of variation. Every other hedging strategy (all of Rollovers #1-4 and not hedging at all) performed more poorly in stability terms than the ICA-era income streams. It also bears mentioning that the plain annual and rollover annual hedges in the Mexican case generated an average, real annual income over the years of the crisis that ranged from $33,000-$36,000 pesos, which is less than half of the annual average during the ICA era.

While data on intra-seasonal stability was unavailable, these comparisons are nonetheless quite revealing. The ICA era saw a farmer of average size earning almost 50% more than did the same farmer during the coffee crisis with the most profitable hedge in place. Further, incomes earned under the ICA outperformed four out of five hedging strategies from Chapter 4 and not hedging in terms of inter-seasonal stability. Last, the annual hedges (plain and rollover), which outperformed ICA-era income in terms of stability, generated an average annual income less than half of that which was generated during the ICA era. This suggests that the ICA and INMECAFE succeeded in substantially raising incomes relative to those that prevailed during the recent crisis (with
and without hedges in place), as well as stabilizing incomes to a greater degree than most of the hedging strategies.

On income security grounds supply management appears rather different than it does in the portraits painted by critics. I do not want to romanticize the ICA, nor the marketing boards that supported its operation. In many cases, like in Uganda, marketing boards were extensions of dictatorial power and control. They frequently over-taxed farmers, denied them fair prices for their coffee, and undertook to manage domestic markets with marked inefficiency. Yet, the data above from Mexico nonetheless makes an important point: farmer incomes were higher and more stable when global coffee supplies were publicly managed. Even if public supply management is determined not to be a viable policy option, the evidence suggests the crucial importance of other policies that will effectively reduce world coffee supplies (e.g. diversification of various types).

It is true that today supply management is not a very popular income security alternative, particularly among international development institutions like the World Bank. That said, coffee producing countries including Mexico continue to raise the issue and attempt implementation from time to time, most notably during times of crisis.

In 2001 the Association of Coffee Producing Countries (ACPC) publicly admitted to the failure of the group’s efforts (beginning in 2000) to reduce global coffee supplies and stem falling prices (BBC 10/19/01). Like many of the efforts that preceded the ICA in the 1930s-1950s, the ACPC scheme fell prey to free riding and lack of support from coffee consuming countries. While Brazil and Columbia (respectively the worlds 1st and 3rd largest producers) withheld stocks other smaller producers continued to sell as much coffee as possible, thus shifting the burden of the scheme onto the big producers.
Vietnam, the world’s 2nd largest producer, did not take part in the scheme initially although it did voluntarily withhold some supplies later on. Further, the agreement had no support from consuming countries, meaning that free riders could sell their coffee to consumers without penalty. The complex confluence of factors that maintained the ICA for almost three decades appeared to be lacking in the recent crisis (Bates 1997 and Talbot 2004 are excellent sources of information on the complexity of the ICA).

Mexico, for its part, signed onto the ACPC supply management attempt in 2000. Record coffee production, combined with widespread farmer protests of low prices, led the government to temporarily go back on its coffee liberalization agenda. The supply management effort was also supported by several prominent Mexican coffee associations, the Confederación Mexicana de Productores de Cafe (CMPC) and the Asociación Mexicana de Exportadores de Cafe (AMEC). It is not so surprising that price crises revive interest in supply management among governments, farmers and even exporters. As the recent US financial crisis also illustrates, government intervention is often received more favorably when free markets broadly fail to provide adequately for the needs of their participants.

Indeed, suggestions to bring public price stabilization and supply management back to life have become more frequent, though not mainstream, since the coffee crisis (and, even more recently, in the face of spiraling food prices). The FAO’s Committee on Commodity Problems notes that “supply management is at the centre of the 2003 proposals put forward in the WTO Committee on Trade and Development by a number of African countries” (2007, 2). Oxfam among other NGOs has consistently maintained that

supply management is essential to ensuring coffee farmer well being (Charveriat 2001, Gresser and Tickell 2002, Daniels and Petchers 2005).

In dismissing this as a viable, present option the FAO notes the following “practical difficulties and complexities”, including: free rider problems; ensuring political commitment by necessary parties (particularly consumers); financing problems; and, the different global market positions of producers and the problems for cooperation this engenders (FAO 2007, 4-5). These lessons are taken straight out of the ICA’s experiences during the 1980s when the regime began to crumble. The FAO’s final assessment is that: “The manipulation of commodity prices based on the management of supply appears to be regarded with some degree of skepticism, at least by the consuming countries, partly because previous attempts have proved to be ineffective and unsustainable, and partly because many countries, the developed consuming nations in particular, are no longer prepared to support them (2007, 6).” International cooperation, a prerequisite of supply management, is thus not forthcoming at the present time. Moreover, it is the developed countries that seem most resistant to its revival.

**Alternative crop diversification in Brazil**

In general, diversification is thought to insulate farmers from coffee price risk insofar as a smaller proportion of income is dependent upon the vagaries of the traditional green coffee market. Indeed, diversification may allow farmers to engage in more remunerative activities than coffee farming and/or activities that take place in more stable market settings. Daniels and Petchers (2005) discuss diversification in terms of generating a diverse “income portfolio” for coffee farmers, in which family income is dependent on a variety of sources. Further, diversification can potentially provide income security
benefits not only to those who diversify, but also to farmers who remain dependent on coffee. This is because it can potentially reduce global coffee supplies such that cash prices rise and/or become more stable, as well as lessen competitive pressures. Below I discuss alternative crop diversification in general and in Brazil in particular.

Diversification into other agricultural crops tends to take two forms: producing other crops in subsistence gardens to be eaten by farmers and their families and producing other crops for export. While the former seems quite sensible from an income security perspective, the latter is not necessarily so.

Growing food crops in subsistence fashion alongside export crops like coffee is highly beneficial from an income security perspective. This is so for two reasons. First, to the extent that grown food replaces purchased food, the income insecurity that results from coffee production and sales will not impact farmer and family abilities to remain well-nourished. Indeed, coffee farmers often “self-insure” during times of low and unstable incomes by reducing nutritional intake. This sort of coping mechanism could be avoided to some extent if farmers plant subsistence gardens. Second, to the extent that grown food replaces purchased food, this potentially frees up income to be spent on other items like medical expenses and school fees that are also often curtailed during times of crisis. As will be noted below, many small Brazilian coffee farmers already utilize this strategy (as do their small Mexican and Ugandan comrades). While diversification is often lamented on the grounds that it prevents economies of scale from being reached and reduces the land planted to cash crops (see ITF 2002), there is evidence to suggest that home gardens are very important to the well being of small farmers especially during times of crisis (e.g. Sayer 2002; Eakin et al. 2006; Jacome 2004). Diversification and
crop rotation can also have the added benefits of preventing soil-nutrient depletion and soil erosion.

However, diversification into other crops for export is significantly more problematic from an income security perspective. This is so because the price behaviors that prevail in other agricultural commodity markets are very similar to those that prevail in the coffee market. Chapter 3’s discussion of coffee market behavior cited a recent study by IMF researchers as to trends in coffee prices (Cashin et. al. 1999). This same study addresses price behavior in markets for over 30 other widely-produced commodities, including soybeans, maize, wheat, cocoa, tea, sugar, cotton and livestock of various types. The authors’ general findings parallel those for coffee: price slumps last longer than price booms; slumps are of a greater magnitude than booms; there is no consistent shape to the price “cycles” identified; and, the probability of remaining in a slump is independent of how long the slump has already lasted (Cashin et. al. 1999, 19).

This suggests that diversification into other crops will not be a remedy for long-term secular declines in commodity prices. It also suggest the substantial volatility of various commodity prices. Indeed, researchers at the IISD note that, “price volatility is increasing across a broad range of commodities. In the past 30 years, there have been as many price shocks across the range of commodities as there were in the preceding 75 years (Brown et. al. 2008, 1).” The IMF notes that a cotton crisis is currently brewing in Burkina Faso, among other cotton producing countries, due to declines in world cotton
prices. In India, pepper and tea prices also fell precipitously during the same period as did coffee prices (late 1990s and early 2000s).

It is thus highly likely that diversification into alternative crops will raise precisely the same income security issues as coffee production itself. Even for food crops (produced for export), for which relatively inelastic demand may in theory reduce the extent of price volatility and decline, evidence suggests that price behavior in such markets is highly variable and prone to crisis. Following a roughly yearlong rise from mid-2007 through mid-2008, the FAO notes that cereal prices have declined by as much as 50% since September 2008.

That said, there is some new research on the benefits of diversification into horticultural crops, i.e. fruits, vegetables, roots, tubers, mushrooms and ornamentals, that tend to command higher prices in export markets. Dorsey’s (1999) field research in Kenya found that small coffee producers had successfully and simultaneously grown for export French beans, tomatoes and avocados. The author notes: “Almost all smallholders in the study area specialize in coffee production, but those who were most diversified [into several commercial crops] were more economically successful and relied less upon subsistence-oriented food crop production (Dorsey 1999, 188).” This suggests that diversification into horticultural crops was so successful that subsistence food production was no longer necessary to any large degree—i.e. commercial crops generated enough income to purchase sufficient quantities of food.

While promising, the “fallacy of composition”, a term coined by economists, bears remembering. Indeed, how many farmers will be able to move into fruit and vegetable production before the prices of these commodities also collapse (more on this below in the Uganda discussion)? Further, Dicken (2007) notes that fruit and vegetable production and the income earned from so doing in Africa and elsewhere is often constrained by the power of supermarkets and other large retailers. Much as roasters and manufacturers put downward pressure on the incomes of coffee farmers, so too do supermarkets for other kinds of farmers.

Even so, relative to the production of traditional export crops (like cereals, cotton and the tropical beverages), horticultural crops appear much more promising from an income security perspective. Existing research, like that cited above, is suggestive of this point. Further, Dicken (2007) notes that markets for horticultural products tend to be regional, rather than global, suggesting the possibility of less volatile prices. In larger markets there is a greater likelihood of market shocks because the market covers a broad geographic area. The geography of horticultural commodity chains perhaps also implies that producers of such crops may be more insulated from competitive pressures, and thus more income secure, relative to producers of crops traded in global markets like coffee. Regionalization is due to the fact that many horticultural crops are not easily stored for long periods of time or transported over large distances due to their tendency to spoil rather quickly. 99 In addition, demand for fruits and vegetables is fairly income elastic (as incomes rise so does demand), suggesting room for market expansion in the future as per

99 The Flavr Savr tomato was genetically engineered by Calgene (later purchased by Monsanto) in the mid-1990s to try to extend the shelf-life of the traditional tomato.
capita incomes continue to rise in much of the developing world. Making the picture even rosier, Domiani (2000) remarks that the production of many horticultural crops are subject to decreasing returns to scale, suggesting advantages for small farmers.\textsuperscript{100}

The development potential of horticultural crops has not gone unnoticed in developing countries: “Exports of horticulture, livestock, fish, cut flowers, and organic products now make up 47 percent of all developing-country exports, far more than the 21 percent for traditional tropical products such as coffee, tea, and cotton” (World Bank 2008, 60; note that these calculations are by value). All in all, nontraditional agricultural exports are an increasingly important component of agricultural exports and developing country producers are rapidly increasing their share in markets for such crops.

Brazil in particular is often held up as a model of successful agricultural diversification. This is so particularly insofar as the Brazilian agricultural sector has generally witnessed reduced dependence on traditional crops like coffee and orange juice, and has seen growth in soybean, sugar, poultry, porkmeat and horticultural crop production and export. Indeed, the World Bank notes that “Brazil, Chile, China, and Mexico dominate nontraditional agricultural export markets” (World Bank 2008, 60). The USDA notes that Brazil is a “major” world producer of horticultural crops, with the value of fresh fruits and vegetable exports in 1998 amounting to roughly US$120 million,

\textsuperscript{100} The advantages to being small accrue from: labor intensive monitoring processes, “rapid returns to capital” for annual crops (relative to perennials like coffee), and the labor intensive nature of organic production (Domiani 2000, 6).
which is roughly 25% of the value of its coffee and coffee product exports the same year.  

Damiani’s (2000) study of Brazil’s experience with horticulture explains that the Petrolina-Juazeiro region in northeastern Brazil was fundamentally transformed by nontraditional agricultural export growth between the 1970s and 1990s. The region’s residents had previously been very poor and frequently subject to harsh climatic conditions (drought). By the 1990s, however, “Petrolina-Juazeiro had developed a major agricultural industry based on irrigation and was known throughout Brazil as the country’s largest producer of tropical fruits, with exports of approximately US$70 million per year (Damiani 2000, 2).” In addition to tropical fruit exports, the region also produces tomatoes, asparagus, onions, passion fruit and other crops for domestic consumption in higher-income areas.

Damiani crucially notes that small producers are active in these new markets and have met with high levels of success. Data from the OECD indicates that, relative to coffee production, small family farms in Brazil capture a much greater share of fruit and vegetable production by value (OECD 2005, 178).

The Brazilian government played an enormous role in facilitating the region’s transformation. Assistance was provided across a range of activities including infrastructure development (especially irrigation), technical assistance, research, and worker training, and access to credit (Domiani 2000). Yet, the Brazilian government’s hands-on approach in this region contrasts sharply with its approach to small coffee

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farmers in other parts of the country. This crucially suggests the importance of directly targeting small coffee farmers with alternative crop diversification initiatives.

Recent research by economic geographers in the Brazilian state of Minas Gerais indicates the following about alternative crop diversification among small producers in “rural, isolated and poverty-stricken” areas: “Many farmers are financially dependent solely upon coffee, dedicating their land, water, and labour to its production, while reserving few resources to grow subsistence crops or to diversify production (Watson and Achinelli 2008, 228).” Small, poor producers tend to grow some food crops alongside coffee, but do not produce other cash crops. “Family gardens provide a small amount of staple foods like beans, corn, and vegetables; however, farmers typically rely on coffee as a cash crop that provides income for the purchase of food, household goods, clothes, basic medical care, and other commodities (Watson and Achinelli 2008, 230).”

Watson and Achinelli further note that while the government does provide subsidized credit to small producers, it does so only to finance coffee production and not the production of alternative crops (2008, 229). Further, recent studies by Brazilian governmental agencies cited by the authors indicate a governmental preference for continuing to promote the production of sun-cultivated coffee, a policy orientation with negative implications for the price of coffee and environmental sustainability (2008, 230). This is perhaps due to the fact, as the authors note, that coffee is still regarded as

102 Sun-grown coffee, popular in Brazil, is an environmental hazard in several respects. Bird habitats are destroyed when land is cleared for coffee; plant diversity is threatened in coffee-growing regions; and soil erosion is endemic among small producers who often plant trees on steep slopes. The dryness facilitated by sun cultivation combined with the angle of the slopes means that farmers lose a lot of soil each year during the monsoon season. See Watson and Achinelli 2008; Dicum and Luttinger 1999.
a “strong” crop in Brazil. While this may indeed be the case for larger producers, for small producers coffee is an increasingly weak crop.

Brazil’s success in fostering the development of a vibrant horticultural sector in the northeast sits uneasily with its apparent neglect of small coffee farmers, who might significantly benefit in income security terms from similar programs and policies. This suggests the crucial importance of policies that specifically target coffee smallholders and incorporate the unique needs of this population. Policies crafted for the coffee sector as a whole, like the Brazilian government’s promotion of more intensive cultivation, may overlook the plight of smallholders. This is especially so in a country like Brazil where the coffee sector is dominated by large estates and coffee is still considered to be a lucrative and viable crop. Brazil appears to have a framework in place for the encouragement of horticultural crop diversification. Further, some coffee farmers have experience growing vegetables in home gardens. It seems reasonable that small coffee farmers could, to some degree, be included in this broader diversification effort.

**Fairtrade in Uganda**

Markets for ethically-traded, organic, bird-friendly (i.e. shade-grown), special origin and other specialty coffees have generated increasing interest over the past decade or so, particularly given the relatively more secure position of farmers producing for these markets during the coffee crisis. Like futures markets, participation in ‘niche’ markets represent a private, market-based income security arrangement. The fact that prices tend to be higher and often more stable in specialty markets (prices are fixed in the case of Fairtrade), has recommended them to many scholars as a means of protecting the incomes
of coffee farmers from the vagaries of the global coffee market. Below I discuss Fairtrade in general and the experiences of Ugandan coffee farmers with Fairtrade.

Fairtrade is an independent, private, non-profit certification and labeling initiative that incorporates principles of economic, social and environmental justice. As such, scholars have noted that Fairtrade networks are “counter-hegemonic” and represent “globalization from below” (Raynolds 2006, 180). The Fairtrade Labeling Organizations International (FLO) notes that Fairtrade allows farmers “to escape from poverty and provide themselves and their families with a decent standard of living”.

Among the movement’s many goals is to ensure that growers of coffee and other commodities receive a “fair” or “remunerative” price for their crop, one that covers the “costs of sustainable production”. Raynolds describes the movement as follows: “The Fairtrade movement is an effort to link socially and environmentally conscious consumers in the North with producers engaged in socially progressive and environmentally sound farming in the South (2006: 180).” Bacon usefully distinguishes between organic and shade-grown coffees on the one hand and Fairtrade coffees on the other. According to him, the former specialty coffees represent efforts to certify the production process, while the latter represent efforts to certify the trade process (Bacon 2004, 500).

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103 Fairtrade should not be confused with “Fair Trade”, with the latter representing a broader movement for social, economic and environmental justice that does not always conform to the strict standards of Fairtrade. Further, many corporations, like Starbucks, have implemented corporate social responsibility (CSR) strategies, the standards of which are lower than those utilized by Fairtrade.

Fairtrade organizations link farmers directly with roasters and other consumers, who pay a fixed price per pound of coffee. The reduction in the number middlemen along the path from field to cup is one way in which Fairtrade coffee networks are able to maintain higher prices for farmers. As of June 2008, the Fairtrade price is US$1.26/pound for washed Arabica beans\footnote{http://www.fairtrade.net/single_view.html?&cHash=39ac7fda2b&tx_ttnews[backPid]=168&tx_ttnews[tt_news]=32. Accessed on 5/26/2008.}, and US$1.01/pound for washed Robusta beans.\footnote{http://www.fairtrade.net/fileadmin/user_upload/content/Robusta_Price_Chart_89-07.pdf Accessed on 5/26/2008.} If world market prices exceed the Fairtrade price, farmers receive the higher world price (i.e. there is no penalty for Fairtrade farmers when world prices are very high). In addition to this price, producers receive a US$0.10/pound premium dedicated to social and community investment. Such social investments help producers gain access to better financing, community-owned and operated transportation and communications systems, technical assistance, and health and education services.

Currently, the FLO has 20 member labeling organizations in 21 countries that certify the following commodities: coffee, tea, rice, bananas, mangoes, cocoa, cotton, sugar, honey, fruit juice, nuts, fresh fruit, quinoa, herbs, spices, and wine.\footnote{http://www.fairtrade.net/about_fairtrade.html. Accessed on 5/26/2008.} Almost one and one half million farmers and workers, represented by over 600 producer organizations in 51 countries currently reap the benefits of Fairtrade.\footnote{http://www.fairtrade.net/figures.html. Accessed on 5/26/2008.} In the coffee context, however, Fairtrade sales are only a small proportion of total global sales. In 2005, Fairtrade sales were less than 1% of total global coffee production, by volume (although by value
Fairtrade’s share would be somewhat higher). Baffes and colleagues note that “differentiated” coffee sales, i.e. trade outside of “traditional channels” including fairly traded, organic and other ‘niche’ coffees, accounted for roughly 6-8% of global consumption. They also report that, of the 240,000 60 kilogram bags of Fairtrade coffee consumed in 2001, over 40% was consumed in Germany and the Netherlands (2005, 207).


**Figure 6.2**

![Graph showing price patterns of organic, Fairtrade, and Fairtrade-organic coffees between 1998 and 2005.](image)

Across all forms of specialty coffee, then, farmers can expect to receive a higher price relative to traditional coffees. In the case of Fairtrade the price is fixed and higher than the base market price during the coffee crisis. This suggests that the incomes of producers of Fairtrade coffees will be higher relative to the incomes of producers of traditional coffees. In terms of income inequality, this raises the possibility that Fairtrade
producers might see their incomes rise relative to those of traditional producers. The work of other researchers also suggests this possibility (e.g. Bacon 2005, Raynolds, et. al. 2006). Like futures hedging, Fairtrade advocacy to the exclusion of alternatives may also exacerbate income inequality within coffee farming communities.

Looking to the Ugandan case more specifically, a Robusta farmer receiving US$1.01 per pound of Fairtrade coffee would have fared better in absolute income terms than the hypothetical farmer from Chapter 4 for every hedging strategy that I devised there. Recall that Rollover #2 was the most profitable strategy across the four years of the coffee crisis in Uganda. However, the effective price\textsuperscript{109} of coffee over the four crop years covered by that hedge was only US$0.63 per pound. This is almost 40\% less per pound than the Fairtrade Robusta price. Moreover, in contrast to the prices received via hedging, the Fairtrade price is fixed, resulting in both stable and certain incomes to the extent that price behavior contributes to farmer income security.

While Fairtrade prices are indeed stable at present, farmers generally tend to be highly uncertain of how much Fairtrade coffee they will be able to sell. While the share of specialty coffee sales in total coffee sales has been steadily growing in some big consumer markets like the US (see Ponte 2002), these markets are very susceptible to deterioration in consumer demand, perhaps even more so than is the traditional coffee market. In times of recession or depression, cheaper traditional coffees often substitute for specialty coffees. And, in Europe the upward trend in specialty coffee sales appears to be slowing as it approaches some sort of “ceiling” (Raynolds et. al. 2006, 183).

\textsuperscript{109} The “effective price” is simply the gains from the hedge and from coffee sales over the four years averaged across the quantity of coffee sold. I.e. (gains from hedge from 2000-03 + gains from coffee sales from 2000-03)/(quantity of coffee sold).
Raynolds and colleagues thus note that: “the Fair Trade market in the North remains a fundamental force in determining the success or failure of such efforts. In each of the case studies cooperative members and researchers alike raised concerns about both the size and trajectory of the Northern markets (2006, 183).”

Even further, although Fairtrade and other specialties presently command a significant premium relative to traditional beans, this is a state of affairs that may become quite precarious in the future. What economists call a “fallacy of composition”, Oxfam researchers discuss in terms of all “running for the same exit”: “Not all poor producers can move into the premium market… If too many producers try to move into this segment of the market, it would cease to be a niche capable of commanding high prices (Gresser and Tickell 2002, 42).” This suggests that while diversification into specialties is a viable option for some producers, it is not a sustainable solution for large populations of coffee farmers.

Specialty coffees like Fairtrade have recently been seen as a real potential diversification and income security avenue for farmers in Uganda. However, Bigirwa (of NUCAFE, a prominent national coffee association) notes that the Fairtrade certification process has been a barrier for coffee farmers in the past: “It involves pre-assessments, inspection, verification and certification to assure that the commodity conforms to the code. Certification has been one of the hindrances to farmers joining fair-trade as it is quite expensive especially at the start (2005, 2).” The author further notes that whether as individuals or as cooperatives, small producers will need significant assistance in the certification process as well as with quality improvement. Much like
futures markets, cost, information and knowledge obstacles constrain the ability of Ugandan coffee farmers to access Fairtrade markets.

Further, as was the case with futures market intermediaries, Ugandan Fairtrade cooperatives also need assistance in overcoming these obstacles. Intermediation has not been sufficient in itself to overcome market access obstacles in the Ugandan context. Birgirwa notes: “The certification costs and the process of acquiring registration is another bother to the young and not well empowered cooperatives. For example, normally an association will not have money to pay upfront for initial registration (2005, 3).” As with supply management, making Fairtrade viable in Uganda will likely require international assistance and cooperation, in this case with financing Fairtrade certification.

Birgirwa also notes that cooperative organization, a prerequisite of Fairtrade, is a difficult task for “peasant” and “poverty-stricken” communities like smallholder coffee communities in Uganda. This has especially been the case since liberalization. The dismantling of the Ugandan Coffee Board (UCD, a marketing board) in the early 1990s led to the abandonment of cooperative organization across large swaths of the coffee farming community (Masiga, et. al. 2007, 16). These are among the obstacles and concerns that have prevented the movement from having much impact in Uganda—as of 2005, only 1% of the Ugandan coffee market was accounted for by Fairtrade.

Further, while “[t]hose farmers who are involved in fair-trade have benefited from the Minimum Price Guarantee and premium price of green beans”, it remains that “farmers still remain raw material suppliers with only primary processing” (Bigirwa 2005, 4). Recollecting the core-periphery model of global production pioneered by
Wallerstein (1974; mentioned in Chapter 3), Bigirwa also writes: “fair-trade was designed in such a way that southern farmers would always depend only on the willingness of Northern consumers to pay a fair price” (2005, 5). In this manner, the author likens Fairtrade’s structure to that of the regular coffee market in which primary commodity producing countries are beholden to the demands of Northern consumers. From the perspective of power inequities, some do not see Fairtrade as much of an improvement.

There are important quantitative and qualitative parallels here between the Ugandan experience with Fairtrade and my assessment of the viability of futures hedging. Much like futures markets, Fairtrade has absorbed and is presently capable of absorbing only a very small proportion of coffee farmers. By my estimation, futures markets could presently assist at most 3% of the coffee farming population, but likely many fewer are actually participating. Similarly, Fairtrade accounts for only 1% of the Ugandan market. One crucial difference here is that there are some small, sufficiently organized and knowledgeable, coffee producers that have been able to access Fairtrade markets, whereas it is only the very largest and wealthiest Ugandan farmers that would be capable of accessing futures markets at the present time.

In terms of policymaking, the Ugandan experience with both futures and Fairtrade suggests that no single arrangement will meet the income security needs of all producers. An income security arrangement for coffee farmers in Uganda will likely have to be composed of various pieces and layers. For those who can access futures markets, this may be a viable, partial solution. For those who can access Fairtrade, this may also be a viable solution. Yet, other policies and institutions will be required to assist those who
remain as well as to compensate for the income security deficiencies and flaws of these other arrangements. It again bears mentioning that both futures markets and Fairtrade networks are more long-term solutions to the producer income problem given the current obstacles to small farmer participation—in either case short- and medium-term income support, particularly in times of crisis, will be required.

Also similar to my analysis of futures markets are the nature of the access obstacles that prevent small farmers from accessing Fairtrade markets—cost, information, knowledge obstacles in the certification process and organizing intermediaries. On the surface, this suggests that small coffee producers in Uganda experience difficulty in accessing markets more generally and that these difficulties are not just limited to futures markets. Despite the decidedly more ethical framework in which Fairtrade operates, this arrangement does not necessarily provide for small farmers.

The similarity of access constraints for small producers across both Fairtrade and futures markets has important implications for agricultural development policy. Ugandan farmers attempting to access different kinds of markets confront remarkably similar obstacles. This suggests that efforts to develop market information systems, revive agricultural extension services, foster cooperative organization, improve rural infrastructure and subsidize income security efforts will likely have broad, sector-wide benefits. The very same institutions, agricultural extension for example, that can provide farmers assistance with hedging could also provide assistance with Fairtrade certification. Across very different markets, successful participation therein has similar prerequisites. The evidence suggests that there is very good reason for policymakers in Uganda to direct their attention towards these ‘base’ requirements for effective market participation.
by small producers. The individual capabilities fostered and furthered thereby might then be applied to participation in all sorts of markets—coffee, Fairtrade, futures, capital, and alternative commodities, just to name a few.

**Summary and significance**

To sum up, this portion of the chapter has illustrated the usefulness of two particular evaluative criteria in analyzing and sorting through the wealth of income security alternatives available in the coffee context: their accessibility and applicability to small coffee farmers and the extent to which they can address the four dimensional producer income problem. Specifically, I have briefly analyzed supply management, alternative crop diversification and Fairtrade, each in a different country case, using the same evaluative criterion as I did previously to analyze futures markets. While certainly not comprehensive, this brief discussion has indeed been suggestive for coffee policy.

First, the analysis of supply management in Mexico produced evidence that the income security arrangement established by the ICA and INMECAFE did a far better job securing farmer incomes than did futures hedging during the coffee crisis. The prices fixed by INMECAFE, and supported by international the quota agreement, yielded income streams for the average Mexican farmer that were generally higher, more certain and more stable than those generated by futures hedging. While proponents of futures markets in the coffee context recommend them over supply management on efficiency and other bases, on income security grounds supply management performs better. If policymakers place priority on securing farmer incomes from price volatility and decline, this finding is rather important. The Mexican case also illustrates the crucial importance of international cooperation in facilitating small coffee farmer income security.
Second, the analysis of alternative crop diversification in Brazil presented evidence that emphasizes the importance of policies that specifically target coffee smallholders. The Brazilian government has had resounding success in fostering horticultural crop diversification in the northeast of the country. The program in question not only ensured more secure livelihoods for producers in that region, but it was also designed so as to specifically benefit small farmers. Yet, the program has not been extended to include small coffee farmers in other regions of the country. The Brazilian government appears to have the means and experience to successfully encourage alternative crop diversification, and many small coffee producers have experience growing vegetables and other nontraditional crops. Thus, even if a promising income security arrangement exists, small coffee farmers will not benefit from such arrangements unless they are specifically targeted by such initiatives.

Last, the analysis of Fairtrade coffee networks in Uganda produced evidence that speaks to the importance of both of these evaluative criteria in sorting through policy alternatives. Fairtrade was found to be superior to futures markets on income security grounds, but not unambiguously so. Even though Fairtrade incomes are likely higher, more secure and more certain than those generated via futures hedging, producer problems in accessing Fairtrade markets suggests relative income dynamics similar to those at work in the futures market context.

Further, many Ugandan farmers are constrained in their ability to access Fairtrade markets, and these constraints bear resemblance to those confronted in the futures market context. Specifically, cost, information and knowledge obstacles were also problematic in the Fairtrade context. This suggests not only the likely need for international
assistance in financing and providing technical assistance, but also that policymakers may do well to consider policies and programs that address basic prerequisites for successful participation in markets in general. That said, those Ugandan farmers who have successfully linked up to Fairtrade are generally small. Moreover, the fact that Fairtrade networks do not and cannot include substantial portions of the Ugandan coffee farming community suggests that ensuring income security for small producers will require the layering and piecing together of many different arrangements.

Conclusions

This chapter has addressed the matter of coffee farmer income security from a policy perspective. I began by discussing recent efforts at futures market intermediation and went on to discuss income security alternatives. The policy question that has framed the analysis bears repeating: Do derivatives-based solutions to the coffee producer income problem warrant the resources, time and energy of those public- and private-sector actors involved in such efforts?

In previous chapters I have addressed this question with reference to the quality of the income security service that futures hedging provides and the nature and extent of producer access obstacles. The analysis undertaken in this chapter suggests several additional points for consideration. I enumerate these conclusions below and discuss their implications for coffee policy.

1. Futures market intermediation has proven to be a difficult and lengthy endeavor in all three country contexts. This is so, in part, because many of the intermediaries isolated and targeted for this purpose confront the very same access obstacles that farmers
themselves confront in accessing futures markets individually. The Mexican and Ugandan cooperatives, as well as the local Ugandan bank, experienced information and knowledge problems, transaction cost problems as well as size problems.

2. Futures market intermediation does not in itself ensure the participation of small producers. The Brazilian CPR and Mexico’s ASERCA program have both failed to systematically incorporate small coffee farmers, and thus appear almost as exclusive as futures markets themselves. Conversely, the Mexican and Ugandan cooperatives are comprised mainly of small producers, but have not met with success due to the access problems noted above.

3. Despite implicit assumptions by researchers to the contrary, futures market intermediation does not always serve a risk reducing purpose. In bridging the gap between producers and futures markets, the cash-settled Brazilian CPR, for example, actually augments the price risk that issuers (farmers) face.

4. Taken together these above points suggest the following larger conclusion: In the three case countries, efforts at futures market intermediation are time-consuming, likely fairly expensive, have not yet shown real success in incorporating small farmers, and deliver an income security service of dubious quality.

5. Income security alternatives exist that provide a higher quality income security service relative to futures hedging. Supply management and Fairtrade are two examples.

6. Income security alternatives exist that have a better track record of including small producers relative to futures hedging. Diversification into horticultural markets in Brazil and Fairtrade in Uganda are two examples.
7. Evidence suggests the importance of public policies that address market access for small producers more generally. If time, energy and resources are to be designated for market-access purposes, they should not be limited to preparing producers to enter futures markets. The prerequisites for futures market access are similar to those required to access other kinds of markets—information, technical assistance, financing and/or subsidies, etc. Programs designed to specifically provide futures market access may redirect resources away from more general programs that may be of broader benefit.

One last important point deserves mention here. In the first portion of the chapter, I expressed concern about how long it has taken for futures market intermediation to progress—in some cases intermediation efforts have been ongoing for 10-15 years. I was concerned specifically because the income problem of coffee farmers is often more urgent than is accounted for in these lengthy experiments, particularly during times of crisis. I have the same concern about all three alternatives discussed. The ICA took two decades to be agreed upon by its signatories. Brazil’s horticultural diversification program met with real success at least a decade, if not longer, after its conception. Fairtrade networks have been developing since the 1980s, and even earlier by some accounts (see Bacon 2004) and have still failed to incorporate large segments of small coffee farming communities.

For all of the faults I have found with futures hedging, it is in the context of short-term direct income support for farmers in crisis that I see a potentially important role for futures markets in public policy. Futures hedging is not a long-term solution to the producer income problem, nor is it a short-term solution in many cases. It is not an arrangement that I would recommend to any small or mid-sized farmer or most
cooperatives, for that matter. Nor would I recommend to policymakers that they spend their limited time, energy and resources on the erection of futures market intermediaries.

However, my data has pointed to the fact that there are significant profits that could be earned from rollover hedging in times of crisis. This suggests a potential way of financing direct, short-term income support for farmers in crisis. While small coffee farmers are generally too small, too poor, too uncertain about yields, and lack the requisite information and skills to effectively trade in futures, governments are not. Governments, like those of Brazil and Mexico, are futures market savvy, have considerable resources to finance trading and absorb the financial impact of yield risk, and are very large entities. A growing body of research suggests that the governments of commodity-dependent countries should be trading derivatives in order to hedge the risk of revenue shortfalls during commodity price crises (e.g. Claessens and Duncan 1993; Dodd 2007). If they can trade in order to ensure their own fiscal security, why can governments not trade on behalf of small producers?

Some sort of direct income fund, meant to assist poor, small producers, could be established, grown and defended by rollover hedging in periods of falling futures prices. Payments could be linked to diversification initiatives, initiatives to foster cooperative organization among small producers, environmental sustainability initiatives, or could simply be given to small producers with no strings attached when their incomes become critically insecure. As an indication that such a program might be successful in the short term, Larson and Coleman (1991) found that hedging with options would have made commodity price stabilization funds more financially viable, reducing in the short run some of the debt burden associated with such schemes. Randall Dodd’s (2007) proposal,
“Puts for People First”, is a different iteration of this idea. Rather than accumulating a fund, governments can assume the risk associated with writing options for small producers and can give them away, free of charge. While neither of these proposals will likely be completely self-financing, they could be mostly so over short periods of time.

The ways in which futures markets can be harnessed to finance programs of short-term socio-economic uplift for small farmers deserves attention from policymakers. That said, the potential for futures markets to finance the amelioration of short-term income insecurity among small coffee producers in crisis is not a substitute for more comprehensive and sustained efforts to develop and implement alternative income security arrangements.
CHAPTER SEVEN
Conclusions

“Burn down your cities and leave our farms, and your cities will spring up again as if by magic. But destroy our farms and the grass will grow in the streets of every city in the country.”

-William Jennings Bryan

Introduction

The object of this investigation was to analyze critically and rigorously one particular instrument with which economic security might be enhanced for coffee farmers and to discuss the extent to which futures markets should be added to the development policymaker’s toolkit.

The analysis was generally framed by the following question:

To what extent do futures markets provide for the income security of small coffee farmers? And, what does this imply for policy?

Several narrower, related questions stemmed from the general research question and framed pieces of the three-part exploration of futures markets, income security and small coffee farmers:

• What exactly does futures hedging do for the incomes of coffee farmers in Mexico, Brazil and Uganda?

• What is the nature and extent of futures market access problems for small producers in Mexico, Brazil and Uganda?

• Is fixing futures market access problems worth the limited time, energy and resources of policymakers, farmers, international organizations and other parties involved in such efforts?

• Are there alternatives to futures markets that may better secure the incomes of small farmers?

This chapter concludes the investigation. In the section that follows below I first summarize the results of the analysis. In the second section below, I discuss what these results imply for coffee policy. Last, the third section describes avenues for future research generated over the course of the dissertation.

**Summary of major findings**

The three part analysis undertaken in Chapters 4-6 produced a body of empirical evidence regarding the income security service that hedging with futures can provide and the extent to which small coffee farmers can partake of these services. The analysis took place in a limited historical and country context, focusing upon Mexico, Brazil and Uganda during the 1998-2002 coffee crisis. This section summarizes the major empirical findings derived from the previous analysis. I summarize first my findings about the income security service that futures hedging can provide. I then provide a synopsis of my findings as to the ability of small producers to access futures markets.
Futures markets and income security

The income security analysis of futures markets conducted in the preceding chapters answered the question as to what exactly futures markets can do for the incomes of coffee farmers. Throughout, I compared the income benefits from hedging with futures to both the producer ‘income problem’ and to the assertions of futures markets advocates about these income benefits. In this manner I triangulated between three analytical and policy ‘points’: 1. What futures markets can actually do for farmer incomes based upon my empirical analysis of the three case countries during the coffee crisis; 2. The extent to which the income benefits from hedging address the four dimensions of the producer income problem (instability, uncertainty, inadequacy and inequality), to wit, the “quality” of the income security service provided by futures hedging; and, 3. The extent to which futures market do for farmer incomes what advocates say they can. Below I address each of these points in turn.

What exactly can hedging on futures markets do for the incomes of coffee farmers in Mexico, Brazil and Uganda? This question was addressed mainly in Chapters 4 and 5. Overall, the evidence I produced suggested the following broad conclusion about the income security service provided for by futures hedging:

The impact of hedging with futures on the stability, predictability, adequacy and (in)equality of coffee farmer incomes is ambiguous. Under certain conditions using certain strategies, in all three case countries farmer incomes were stabilized and made more certain by hedging relative to the income streams derived from selling coffee in the cash market with no hedge in place. Futures hedging held the further promise of raising farmer incomes significantly. Even further, under certain conditions hedging improved
the distribution of income both among farmers of different size and levels of wealth and among various actors along the GCCC.

Yet, under certain conditions using different strategies, farmer incomes were destabilized and falsely predicted by futures hedging. Additionally, though futures hedging was profitable it stopped short of ensuring income adequacy. Futures markets were also in some instances a mechanism for the reinforcement of existing income inequalities insofar as small farmers are precluded from futures hedging, while larger and wealthier farmers and actors along the GCCC can and do use them effectively. Further still, even if all farmers could access futures markets, hedging may still be a vehicle for a worsening distribution of income because the gains from hedging accrue in proportion with the size of the output hedged.

Last, futures market intermediation efforts can improve or worsen the quality of the service that futures market provide depending on the nature and operation of the intermediary in question.

More specifically, the following empirical conclusions were drawn in reference to the income benefits from hedging with futures. These conclusions are classified as either “best case” conclusions (meaning that they underscore the income benefits of hedging) or as “caveats and qualifiers” (meaning that they detract from the best case).

**Best case conclusions**

1. Under the right market conditions and using the right strategy, futures hedging can stabilize income relative to not hedging within a single crop season. This can be empirically supported in the Mexican and Ugandan cases, but not in Brazil.
2. Under the right market conditions and using the right strategy, futures hedging can stabilize income relative to not hedging across multiple crop seasons. This can be empirically supported in all three country cases.

3. If the basis stays constant or strengthens over the course of the hedge, rollover futures hedging can allow farmers to predict their minimum incomes several years into the future. This can be empirically supported in all three country cases.

4. If the basis stays constant or strengthens over the course of the hedge, annual hedging can allow farmers to predict their minimum income up to a year in advance. This can be supported in both Mexico and Brazil, but not in Uganda.

5. Under the right market conditions and using the right strategy, futures hedging can be profitable for farmers, raising their incomes during times of crisis. This can be empirically supported across all three country cases.

6. Under the right market conditions and using the right strategy, futures hedging can lift coffee farmers above the moderate poverty threshold of $2/day. This can be empirically supported only in the Mexican case.

7. Under the right market conditions, futures hedging can be a mechanism for distributing income away from roasters, manufacturers and other large, wealthy and powerful nodes on the GCCC and towards coffee farmers.

8. Futures market intermediation can improve the quality of the income security service provided by hedging on futures markets. This is the case with Dodd’s (2007) proposed program “puts for people first”.

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Caveats and qualifiers to the best case

9. While various hedging strategies can address all three aspects of the producer income problem addressed here, no single strategy can address all three dimensions simultaneously. This can be empirically supported in all three country cases.

10. Certain hedging strategies can severely destabilize farmer incomes both within and across crop seasons relative to not hedging at all. This can be empirically supported in all three country cases.

11. Even those strategies that did stabilize farmer incomes within and across crop seasons left incomes relatively unstable. This can be empirically supported in all three country cases.

12. The strategies that raise farmer incomes most are the very strategies that are most destabilizing both within and across crop seasons. This can be empirically supported in all three country cases.

13. Basis risk can undermine the income predictive capacity of futures markets. This can be empirically supported in all three country cases.

14. Basis risk can result in false income predictions in which the minimum income expected is more than the income received. This can be empirically supported in the Ugandan case.

15. Future price volatility (intra-day, inter-day, intra-year, inter-year) makes farmer choices very significant in income security terms. Choice of strategy and choice of rollover and hedge closing dates, among many other choices, introduce significant variation into the income outcomes of futures hedging. While no market guarantees
individual outcomes, it bears reiterating that this is also the case with futures markets. This can be empirically supported in all three country cases.

16. Future price volatility is responsible for some of the intra-seasonal and inter-seasonal income instability that results from hedging, and can undermine the ability of futures hedging to provide income support during times of crisis. This can be supported in all three country cases.

17. Related to the matter of inter-seasonal price volatility, the absolute income gains from hedging do not accrue to farmers during periods when futures prices are stagnant or rallying. This can result in a lack of income support during those times when income support may be most necessary due to low, stagnant prices. It can also result in inter-year income instability. This can be empirically supported in all three country cases.

18. While futures hedging can raise incomes, in only one instance was futures hedging sufficient to move a coffee family member out of moderate or extreme poverty—the case of Rollover #2 in Mexico. In no other case (i.e. no other country and no other strategy) was futures hedging sufficient to move a coffee family member out of either extreme or moderate income poverty.

19. Whether or not farmers have access to futures markets, hedging can reinforce existing income inequalities among farmers of different types and along the GCCC.

20. Some forms of futures market intermediation produce an income security service of inferior quality to that which hedging can provide alone. The cash-settled Brazilian CPR, which is an entirely speculative vehicle, is a good example.

These broader conclusions are tempered by some variation across the three country cases. For example, the Ugandan and Mexican farmers trading on the London and New
York markets respectively were able to achieve greater levels of intra-seasonal income stability across several hedging strategies compared to the Brazilian farmer. Further, months of negative income were less frequent in Uganda than in the other two cases. This suggests that prices on the London market move differently across a single crop season than do the prices on the New York and Sao Paulo exchanges, exhibiting a smoother downward trend without as large a tendency for prices to reverse themselves.

Reinforcing this conclusion is the fact that in Brazil, hedging performed very poorly in the intra-seasonal stability context. This suggested that prices on the Brazilian exchange were somewhat more volatile than those in New York and London, more volatile even than local cash prices at some points during the harvest. At the very least this suggests that those traders in Brazil who can do so might benefit from hedging on the New York or London exchanges rather than the domestic one.

Other differences across cases were also evident. The cases of the Ugandan plain and rollover annual hedges provided the only examples of a weakening basis of all the strategies employed in all three case countries. This also suggests subtle differences in price behavior across the three different futures exchanges.

Further, only in Mexico was hedging sufficient to raise an average farmer and his family members out of either extreme or moderate poverty. This speaks not only to the substantial gains from Rollover #2 in Mexico, but also to the unique family and production characteristics of Mexican coffee farming communities.

Yet, the significant degree of similarity across my findings in each country case to some extent overpowers these cross-case variations. Indeed, the vast majority of the empirical conclusions enumerated above are empirically sustained across all three cases.
The data suggest that despite being on three continents, growing two different types of coffee, receiving different farmgate prices, and trading on three different derivatives exchanges, a hypothetical farmer from each of the three countries witnessed very similar patterns in regard to the income stability, certainty, adequacy and (in)equality gains from hedging. This perhaps speaks to broad future and cash price correlations across coffee future and spot markets that are globally geographically dispersed. Such inter-market price correlations are suggestive of the high levels of market integration within the global coffee sector.

Moving on to the second and third analytical and policy ‘points’ discussed above, it is thus possible to conclude based on the evidence I have marshaled that futures hedging cannot address all aspects of the producer income problem simultaneously. Strategies that raised incomes most and provide the most long-term income certainty were destabilizing. Strategies that best stabilized incomes across crop years failed to raise them.

Moreover, it appears as if futures hedging cannot address any one of these dimensions of the producer income problem consistently. The income benefits from hedging are highly variable across different strategies. Further, the income benefits from hedging can be dramatically altered by the choices that individual farmers make and the volatility of future prices.

For these reasons, futures hedging can accomplish both more and less than proponents suggest. While hedging can predict and stabilize incomes, it can just as easily accomplish the opposite. Proponents of futures hedging would also do well to note just how profitable futures hedging can be under certain market conditions. At the very least,
This recognition opens up new and interesting policy possibilities (more below). Proponents might also be more cautious in their suggestions that enabling small farmers to trade in futures will somehow ‘level the playing field’ between small producers on the one hand and large commercial farmers, roasters, traders and manufacturers on the other. My evidence suggests that this is not an accurate representation of the relative income dynamics that can arise when various parties undertake hedging operations.

In the next subsection, I summarize my empirical findings in regard to small farmer access.

**Futures markets and small farmers**

The analysis of futures market access problems for small farmers conducted in the previous chapter answered the question as to the nature and extent of these problems in the three case countries. For each of the three case countries I painted an empirical portrait of five different access-related problems, problems derived from the assumptions I made in conducting the income security analysis: farm size and output levels, yield risk, cost, information and knowledge. Below I summarize the empirical conclusions that emerged from this portion of the analysis.

What is the nature and extent of futures market access problems for small farmers in Mexico, Brazil and Uganda? This question was answered mainly in Chapters 5 and 6. Whereas the income security analysis summarized above suggested some homogeneity in my findings, the access-related discussion is characterized more by the heterogeneity of my findings across the three cases.

In particular, the extent and nature of access problems across the three case countries differs significantly. The differences between the Brazilian case on the one hand, and the
Mexican and Ugandan cases on the other, is most clearly suggested by my findings. That Brazil is to some extent an exception to the findings of the other cases hinges mainly upon the impact of size and its related advantages in a liberalized market setting upon farmer prospects for futures market access. Brazilian coffee farms are big relative to coffee farms in Mexico and Uganda. Empirically this resulted in fewer Brazilian farmers being excluded from futures markets due to insufficient lot sizes—less than half of Brazilian farmers are likely excluded on this basis. While still a sizeable contingent, a much larger proportion of Mexican and Ugandan farmers are similarly excluded.

Larger levels of output translate into higher absolute incomes. This suggests that Brazilian farmers may have more resources with which to manage or reduce yield risk. It also means that margin requirements and minimum account balances are less burdensome for Brazilian producers in general than they are for Mexican and Ugandan producers. Further, larger output levels can mean more trading in futures markets, which may make a broker easier to find. Futures market brokerage services are also likely easier to obtain in Brazil because the costs of these domestic transactions are likely less than the costs of the cross-border transactions required for Mexican and Ugandan farmers to trade. Last, to the extent the higher incomes enable farmers to acquire information and communications technologies and training/education, and to the extent that a domestic exchange provides easier access to futures market information, Brazilian coffee farmers are likely least impeded by information and knowledge obstacles of the three cases. In many respects, Brazil is thus a ‘least-likely’ case. Indeed, as hypothesized in Chapter 2, access problems are least problematic in the Brazilian case relative to the situations of Mexican and Ugandan farmers.
There were also significant differences in the access context in the Mexican versus the Ugandan case. One important exception is that similar proportions of the coffee farming population in each country are excluded from futures market participation by virtue of lot sizes. Even though Mexican coffee farms are on average larger than Ugandan ones, the larger minimum lot sizes on the New York exchange made size almost equally problematic in these two cases. Small farm size also portends similar problems with cost, information and knowledge across these two cases. For example, in both the Ugandan and Mexican cases margin requirements are prohibitively costly because absolute income levels are relatively low, which is in turn a partial consequence of small farm size.

However, there are important differences across the Mexican and Ugandan cases. Yield risk is a much more serious problem in Ugandan than in Mexico. While in Mexico relatively infrequent weather events combined with low input application to make yields somewhat variable, Ugandan farmers face additional problems associated with drought and coffee wilt disease. Yield variations are a more multi-faceted issue in Uganda than in Mexico, suggesting that yield risk is more difficult to manage. Indeed, the productivity of Ugandan coffee farms is the lowest across the three cases.

Moreover, Mexican farmers, like their Brazilian counterparts, seem much more likely to possess some sort of personal ICT technology than Ugandan farmers. While in Mexico and Brazil roughly half of the total country population uses cell phones and radios, in Uganda only a very small proportion has access to these same technologies.

Further, while low incomes seems more problematic in Mexico and Uganda relative to Brazil, in Uganda the situation seems most dire of all three cases. The average
Ugandan coffee farm is about 10% of the size of the average Mexican farm, implying lower absolute income levels. This suggests even more severe obstacles to futures market access insofar as income can be used to manage yield risks, pay for hedging-related services and margin requirements, and obtain information and technical training.

While all five access obstacles were thus salient in all three country cases, the nature and scale of access problems differed across them. A spectrum of sorts emerges from the data. Access problems appear least problematic in aggregate in Brazil, more so in Mexico, and most so in Uganda. While futures market access is problematic for many different kinds of coffee farmers, farmers with a particular constellation of correlated traits and characteristics were most likely to be systematically excluded in all three cases: small farm size, little to no means to manage yield risk, no credit, assets or savings with which to finance trading, little to no access to information and information technologies and little knowledge of futures hedging.

One way of thinking about the futures market access spectrum evident across the three cases is to appreciate the correlation that emerged from the data between smallness and its related disadvantages in a liberalized market setting on the one hand, and difficulty accessing futures markets on the other. In other words, the more widespread “smallness” was across the coffee sector of each country, the more problematic was futures market access in the aggregate. The evidence I have marshaled here supports the general comments made in Chapter 2 about the often common experiences of geographically dispersed small producers participating in global, liberalized markets. Indeed, while across country cases the scale and nature of the access problems differed, across the ‘class’ of small producers these commonalities are pronounced.
This heterogeneity in the contours of the access problems in the three countries is countered by marked homogeneity in the context of futures market intermediaries. In many places, interesting and important similarities were observed in the context of intermediation efforts in the three case countries. In particular, the intermediary discussion resulted in the following conclusions:

1. Futures market intermediation has proven to be a difficult and lengthy endeavor in all three country contexts. This is so, in part, because many of the intermediaries isolated and targeted for this purpose confront the very same access obstacles that farmers themselves confront in accessing futures markets individually. The Mexican and Ugandan cooperatives, as well as the local Ugandan bank, experienced information and knowledge problems, transaction cost problems as well as size problems.

2. Futures market intermediation does not in itself ensure the participation of small producers. The Brazilian CPR and Mexico’s ASERCA program have both failed to systematically incorporate small coffee farmers, and thus appear almost as exclusive as futures markets themselves. Conversely, the Mexican and Ugandan cooperatives are comprised mainly of small producers, but have not met with success due to the access problems noted above.

Evidence from all three countries thus suggests that intermediation efforts so far have been rather ineffective in incorporating small producers. The very same obstacles that prevent small producers from accessing futures markets individually also prevent market access via intermediation.

The empirical evidence in all three cases thus illustrates that small coffee farmers are poorly provided for by futures markets, with and without intermediation. While the
extent and nature of access difficulties differs across the three cases, in each case small farmers are similarly excluded. The main reason smallness and its related disadvantages in a liberalized market setting appear least problematic for access in Brazil is that small producers make up a lesser proportion of Brazilian farms overall relative to the other two cases.

Having concluded the summary of empirical results, in the next section I discuss the import of these empirical findings for developing country coffee policy. I encourage the reader to turn back to the “Conclusions” sections of Chapters 4-6 (particularly the summary charts at the ends of Chapters 4 and 5) for more detailed, empirical conclusions than those that were discussed above.

**Policy implications and recommendations**

The empirical conclusions summarized above contain a host of implications for coffee policy. In various ways, the evidence I have marshaled contains suggestions for policymakers as to the extent to which futures markets may be usefully incorporated into agendas for coffee sector development and support. Indeed, what is the appropriate place for futures markets and hedging in the developing country coffee context? The policy questions I have repeated throughout the dissertation bear repeating here one last time: Is fixing futures market access problems worth the limited time, energy and resources of policymakers, farmers, international organizations and other parties involved in such efforts? Are there alternatives to futures markets that may better secure the incomes of small farmers?
The empirical evidence suggests several related answers to these questions which collectively make for an ‘escalating’ policy case:

1. Most simply and directly, this evidence suggests that if policymakers in Mexico, Brazil and Uganda are interested in providing income support to small coffee producers then they should look to other arrangements and not to futures markets.

2. Hedging with futures provides an ambiguous income security service. While helpful in addressing the producer income problem at certain times, hedging exacerbates this problem at other times. Small, poor coffee producers, who can ill afford further destabilization and depression of incomes, likely need much more reliable and consistent income support than futures hedging can provide.

3. Futures markets are currently inaccessible to small coffee producers. Endeavoring to fix market access problems for small producers is time-consuming, expensive and technically difficult and has thus far met with limited success in actually incorporating small producers. Democratizing derivatives is a tall order with dubious benefits in the Mexican, Brazilian and Ugandan coffee contexts.

4. Alternative income security arrangements exist that provide a better quality service (e.g. supply management and Fairtrade) and allow for more comprehensive inclusion of small producers (e.g. alternative crop diversification and Fairtrade).

This is not to say that policymakers in the three countries should discourage futures hedging by those who are currently able to do so. The evidence I have amassed suggests that there are potentially significant income benefits to be gleaned through such risk management techniques. For farmers and other actors dealing in large amounts of coffee, with the means to absorb or manage yield risk, finance trading and absorb hedging-
related losses, with access to timely and accurate present and historical price information, and with some experience or training in hedging, hedging may indeed be a worthwhile pursuit. The evidence I have marshaled suggests no definitive reason to condemn such practices.

What I do mean to say, however, is that the evidence from Brazil, Mexico and Uganda points to the conclusion that continued advocacy of futures hedging and implementation of intermediation schemes in the small coffee farmer context is misplaced and may direct limited resources away from other, alternative income security arrangements and institutions that hold more promise on both income security and small producer grounds.

The evidence from Uganda in particular suggests that efforts to facilitate small farmer market access more generally should perhaps be a higher policy priority. Rather than policymakers and international organizations devoting resources to ‘fixing’ futures market access problems specifically, in Uganda there seems good reason to devote time, energy and resources towards building institutions that can provide reliable information (about cash, futures, alternative crop, capital and other markets) and technical expertise (about hedging, Fairtrade certification, cultivation of horticultural crops, coffee wilt disease eradication, financial planning and debt management, and other topics).

In a great policy irony, the Ugandan case suggests both the crucial importance and critical lack, since liberalization, of resources earmarked for the revival of agricultural extension, the erection of effective and affordable market information systems, and/or to the creation of new institutions that serve as supportive arrangements for small producers navigating global markets. Devoting resources towards the creation/reinvigoration of
institutions that can potentially have broader, beneficial effects seems a more appropriate policy path than dedicating funds to narrowly-focused institutions of dubious benefit to small producers like futures market intermediaries. On this matter, international organizations like the World Bank and UNCTAD might do well to follow the lead of the Ugandan government itself, which has been devoting its meager resources towards the creation of a national MIS for several years.

The Ugandan case also illustrates the poverty of policy recommendations that would require small coffee farmers to shoulder any additional farm-related costs. This is a matter of crucial policy importance that I have refrained from addressing directly thus far. Ugandan coffee farmers are, by and large, exceptionally poor. By my estimation, income from coffee sales during the crisis for a farmer of average size equated to five cents per family member per day. It seems both practically and ethically inappropriate to recommend income security arrangements that require more out-of-pocket expenses for individuals already living in abject poverty. As Dr. King noted in the epigraph to Chapter 5, “it is a cruel jest to say to a bootless man that he ought to lift himself by his own bootstraps.” This same case might also be made for small Mexican and Brazilian producers relative to efforts to have them shoulder the significant costs of futures trading.

The Brazilian case further illustrates the potential of horticultural diversification as an income security alternative. In Brazil, government programs to stimulate fruit and vegetable production in the northeast have a proven track record of lifting small, poor producers out poverty and reinvigorating the local economy. Horticultural crop markets tend to be regional, if not purely domestic, in scope; demand for such crops are relatively income elastic; and, the production of horticultural crops is subject to increasing cost
conditions. Relative to continued production in the coffee market (which is marked by chronic oversupply, stagnant demand and, in Brazil, decreasing cost conditions) diversification into nontraditional crops appears to hold real income security promise for small farmers. While coffee may still be a strong and viable crop for larger producers, for small coffee producers it is an increasingly weak crop.

Programs like that implemented in the northeast ought to be replicated for small coffee producers in other parts of the country. One may even reason that helping small coffee producers diversify into fruits and vegetables may be less costly for the Brazilian government than the program in the northeast implemented previously. This may be so if only because regions where Arabica coffee is produced get regular rainfall and perhaps do not require the extensive and costly irrigation systems that had to be erected in the northeast. It also may be even more successful than the earlier program as per capita income and thus domestic demand for horticultural crops continues to grow in Brazil.

Further still, the Mexican case illustrated the income security benefits of supply management. On virtually every count, the ICA and INMECAFE performed better in income security terms than every hedging strategy during the crisis. Even if such a cooperative international agreement is impracticable in the current political climate, the results of this comparison nonetheless illustrate the crucial importance for small farmer income security of arrangements that serve to reduce global coffee supplies.

Diversification, on- and off-farm, perhaps comes to the forefront in this context. As noted in Chapter 6, diversification not only potentially helps secure the income of those who diversify but can also help those who remain in coffee by reducing coffee supplies.
Further, it is possible that futures hedging might have the opposite effect, i.e. encourage more coffee production. This may be so insofar as protection from coffee price risk encourages producers to plant more seedlings, plant more land to coffee, and/or increase applications of labor, other inputs and various production technologies. Indeed, this is precisely what futures market advocates hope will result from more stable and certain incomes (see, e.g., the discussion of capital rationing in the middle of Chapter 4). Income security arrangements that exacerbate and reinforce the long-term secular decline in and shorter-term price volatility of coffee prices by indirectly contributing to mounting supplies are perhaps wholly inappropriate responses to small coffee farmer income insecurity.

All of this is to say that superior income security alternatives to futures markets for small farmers exist and thus appear to be more fruitful and worthwhile objects of policymakers’ attention and limited resources. This is not to say, however, that there is no income support role for futures hedging in the coffee context.

For all of the faults I have found with futures hedging, it is in the context of short-term direct income support for farmers in crisis that I see a potentially important role for futures markets in public policy. Futures hedging is not a long-term solution to the producer income problem, nor is it a short-term solution in many cases. It is not an arrangement that I would recommend to any small or mid-sized farmer or most cooperatives, for that matter. Nor would I recommend to policymakers that they spend their limited time, energy and resources on the erection of futures market intermediaries.

However, my data has pointed to the fact that there are serious profits to be had from rollover hedging in times of crisis. This suggests a potential way of financing direct,
short-term income support for farmers in crisis. While small coffee farmers are generally too small, too poor, too uncertain about yields, and lack the requisite information and skills to effectively trade in futures, governments are not. Governments, like those of Brazil and Mexico, are futures market savvy, have considerable resources to finance trading and absorb the financial impact of output variations, and are very large entities. Indeed, a growing body of research argues that the governments of commodity-dependent countries should be trading derivatives in order to hedge the risk of revenue shortfalls during commodity price crises (e.g. Claessens and Duncan 1993; Dodd 2007). If they can trade in order to ensure their own fiscal security, why can governments not trade on behalf of small coffee producers?

Unlike banks and other intermediaries that are profit-maximizing, responsible to shareholders or simply small and underfunded, governments can absorb risk and losses on behalf of those they serve. Indeed, I would argue that this is one of the main purposes of government.

Some sort of direct income fund, meant to assist poor, small producers, could be established, grown and defended by rollover hedging in periods of falling futures prices. Payments could be linked to diversification initiatives in Brazil, initiatives to foster cooperative organization among small producers in Uganda, environmental sustainability initiatives in all three countries, or could simply be given to small producers with no strings attached when their incomes become critically insecure. Randall Dodd’s (2007) proposal, “Puts for People First”, is a different iteration of this idea. Rather than accumulating a fund, governments can assume the risk associated with writing options for small producers and can give them away, free of charge. While neither of these
proposals will likely be completely self-financing, they could be mostly so over short periods of time.

The ways in which futures markets can be harnessed to finance programs of short-term socio-economic uplift for small farmers deserves attention from policymakers. That said, the potential for futures markets to finance the amelioration of short-term income insecurity among small coffee producers in crisis is not a substitute for more comprehensive and sustained efforts to develop and implement alternative long- and short-term income security arrangements.

Have argued this policy case, in the next section I describe avenues for future research.

**Avenues for future research**

A number of avenues for future research are suggested by this analysis, several of which I outline below.

First, coffee is not the only crop-context in which futures markets have been recommended to developing country farmers nor is price risk the only farm-level risk that can potentially be managed with derivatives instruments. The ITF has also included cotton, cocoa, rice and other traditional cash crops in its research efforts. In the US, various farm agencies are attempting to integrate hedging into the risk management practices of smaller cereal farmers (e.g. wheat, soy, corn, rice). Weather derivatives, usually linked to rainfall indexes, have also gained some recent attention. These instruments are conceived by some to be good substitutes for traditional crop insurance programs and may ultimately be packaged with derivatives-based price insurance to
provide more comprehensive farm-level support. A systematic income-based analysis of
such proposals and their usefulness for small farmers might make important contributions
to policy debates and research endeavors.

Second, additional research into coffee itself seems warranted. As mentioned
throughout there are a variety of policy solutions that have been suggested in the coffee
context. This investigation has addressed one dimension (income security) of one
possible solution (futures markets). The application of different evaluative criteria to
coffee futures markets may be important—for example, while “efficiency” is generally
cited as among the factors that recommend futures markets in agriculture, virtually no
studies have systematically evaluated coffee futures markets in this context. Other policy
solutions, like Fairtrade, specialty coffees, and diversification, may also benefit from
systematic income-based analyses. Even further, the interaction between these different
arrangements will be important to study, particularly if policymakers try to layer or
combine different solutions (this seems rather likely). My own analysis suggests the
potential for both cooperation and conflict in the coffee context between different income
security arrangements.

Further still, the experiences small producers in other coffee producing countries
with derivatives also warrants additional research. In particular, the Indian experience
may be especially noteworthy due to the fact that, like Brazil, India has its own (actually
several) domestic coffee exchanges.

Third, the investigation raised a lot of other questions about developing country
agriculture that seem underrepresented in current research programs. I list only a few
these here: the problem of smallness; the relationship between farm debt, access to credit
and farmer poverty; the manner in which financial intermediation alters the financial
service provided to clients; the development potential of horticulture; and, the apparent
synergy between “traditional” farming techniques and environmentally sustainable
development goals.

Fourth, “risk privatization” and the correlate marketization of income support
provision via futures markets is not limited to agriculture. Some researchers have
suggested that foreign exchange derivatives trading may be able to insulate small and
mid-sized firms from exchange rate fluctuations, eliminating the need for managed
currencies. Others, like Robert Shiller, have argued that derivatives on GDP and
occupational indexes might in the future replace parts of the welfare state like
unemployment insurance and the minimum wage. Future research that keeps pace with
such policy and technological innovations will be important contributors to public
debates about income support provision and the economic security role of governments.

As of this writing, the global economy is experiencing serious turmoil. Derivatives
and other complex financial instruments (like collateralized debt obligations) have
contributed importantly to the crisis, notably in the US, a country which has advocated
and supported the integration of derivative instruments into a host of different economic
and policy arenas over the past several decades. As noted throughout, derivatives
advocacy has also become common in the developing country agricultural context.
Futures exchanges are sprouting up across the developing world and commodity-
dependent governments and farmers alike are increasingly urged to participate. It is my
hope that the forgoing analysis and discussion has contributed to an understanding of the current and potential role of futures markets and like institutions in the global economy.
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Appendix: Hedging Strategies

MEXICO

• Rollover Strategy #1:

1. In late March 1998, sell two May 1998 futures.
2. In early May, buy back two May contracts and sell two July contracts.
3. In early July, buy back July contracts and sell two Sept contracts.
4. In early Sept, buy back Sept contracts and sell two Dec. contracts.
5. In early Dec, buy back both Dec. contracts and sell two March 1999 futures.
6. In early March, buy back both March futures, and sell one May 1999 contract.
7. In early May, buy back May contract and sell one July future.
8. In early July, buy back July contract and sell one Sept future.
10. In early Dec, buy back Dec contract and sell one March 00 future
11. In early March, buy back March 00 future.

• Rollover Strategy #2:

1. In late March 1998, sell four May 1998 futures.
2. In early May, buy back four May contracts and sell 4 July contracts.
3. In early July, buy back July contracts and sell 4 Sept contracts.
4. In early Sept, buy back Sept contracts and sell 4 Dec. contracts.
5. In early Dec, buy back both Dec. contracts and sell 4 March 1999 futures.
7. In early May, buy back May contracts and sell 3 July futures.
8. In early July, buy back July contracts and sell 3 Sept future.
9. In early Sept, buy back Sept contracts and sell 3 Dec contract.
10. In early Dec, buy back Dec contracts and sell 3 March 00 future
11. In early March, buy back March 00 futures, and sell 2 May 00 futures.
12. In early May, buy back May contracts and sell 2 July futures
13. In early July, buy back July futures and sell 2 Sept futures
14. In early Sept, buy back Sept contracts and sell 2 Dec contracts
15. In early Dec, buy back Dec contracts and sell 2 March 01 contracts
16. In early March, buy back March contracts and sell one May 01 contract.
17. In early May, buy back May contract and sell one July future
18. In early July, buy back July future and sell one Sept future
19. In early Sept, buy back Sept future and sell one Dec contract
20. In early Dec, buy back Dec contract and sell one March 02 contract
• **Rollover Strategy #3:**
  1. In March 2000, sell one May 00 future
  2. In early May, buy back May contract and sell one July contract
  3. In early July, buy back July contract and sell one Sept contract
  4. In early Sept, buy back Sept contract and sell one Dec contract.
  5. In early Dec, buy back Dec contract and sell one March 01 contract.
  6. In early March 01, buy back March contract.

• **Rollover Strategy #4**
  1. In March 2001, sell one May contract
  2. In May, buy back May contract and sell one July contract
  3. In July, buy back July contract and sell one Sept contract
  4. In Sept, buy back Sept contract and sell one Dec contract
  5. In Dec, buy back Dec contract and sell one March 02 future.

• **Annual Rollover**
  1. In late March 1998, sell one May 1998 future.
  2. In early May, buy back one May contract and sell one July contract.
  3. In early July, buy back July contract and sell one Sept contract.
  4. In early Sept, buy back Sept contract and sell one Dec contract.
  5. In early Dec, buy back Dec contract and sell one March 1999 future.
  6. In early March, buy back one March future, and sell one May 1999 contract.
  7. In early May, buy back May contract and sell one July future.
  8. In early July, buy back July contract and sell one Sept future.
  10. In early Dec, buy back Dec contract and sell one March 00 future
  11. In early March, buy back March 00 future, and sell one May 00 future.
  12. In early May, buy back May contract and sell one July future.
  15. In early Dec, buy back Dec contract and sell one March 01 contract.
  16. In early March, buy back March contract and sell one May 01 contract.
  17. In early May, buy back May contract and sell one July future.
  20. In early Dec, buy back Dec contract and sell one March one contract.
BRAZIL

• **Rollover Strategy #1:**

1. In early April 1998, sell two May 1998 coffee futures
2. In early May 1998 buy back both May futures and sell two July 1998 futures
6. In early March 1999, buy back March contract and sell one May 1999 future

• **Rollover Strategy #2:**

1. In early April 1998, sell four May 1998 coffee futures
2. In early May 1998 buy back all May futures and sell four July 1998 futures
6. In early March 1999, buy back all March contracts and sell three May 1999 futures
7. In early May 1999, buy back all May contracts, and sell three July 1999 futures
10. In early December 99, buy back Dec 99 contracts and sell 2 March 2000 contracts
11. In early march 2000, buy back March 00 contracts and sell two May 00 contracts
12. In early May 2000, buy back May 00 contracts and sell two July 00 contracts.
13. In early July, buy back July 00 contracts and sell two Sept 00 contracts.
16. In early March, buy back March 01 contract and sell one May 01 contract
17. In early May, buy back May 01 contract and sell one July contract

• **Rollover Strategy #3:**

1. In October 1999, sell one Dec. 1999 futures contract
2. In early Dec 1999, buy back Dec contract and sell one March 2000 contract
3. In early March 2000, buy back March contract and sell one May 2000 contract
4. In early May 2000, buy back May contract and sell one July 2000 contract
5. In early July, buy back July contract and sell one September 2000 contract
6. In early September, buy back the Sept. contract.

- **Rollover Strategy #4:**

1. In October 2001, sell one Dec 2001 contract
2. In early Dec, buy back Oct 01 contract and sell one March 02 contract
3. In early March 02, buy back March contract and sell one May 2002 contract
4. In early May 02, buy back May contract and sell one July 2002 contract
5. In early July, buy back July 02 contract and sell one Sept 02 contract
   (prices paid to Brazilian Arabica growers in Sept 02 = $US0.28/lb).

- **Annual Rollover**

1. In early April 1998, sell one May 1998 coffee future
2. In early May 1998 buy back all May future and sell one July 1998 future
6. In early March 1999, buy back all March contract and sell one May 1999 future
8. In early July 1999, buy back July future and sell one Sept 1999 futures
10. In early December 99, buy back Dec 99 contract and sell 2 March 2000 contract
11. In early march 2000, buy back March 00 contract and sell one May 00 contract
12. In early May 2000, buy back May 00 contract and sell one July 00 contract.
13. In early July, buy back July 00 contract and sell one Sept 00 contract.
14. In early Sept, buy back one Sept 00 future, and sell one Dec. future
16. In early March, buy back March 01 contract and sell one May 01 contract
17. In early May, buy back May 01 contract and sell one July contract

**UGANDA**

- **Rollover Strategy #1:**

1. In June 1999, sell two July 1999 contracts.
2. In July 1999, buy back both July contracts and sell two Sept 99 contracts
3. In Sept 1999, buy back both Sept contracts and sell two Nov 99 contracts
4. In Nov 1999, buy back both Nov contracts and sell two Jan 00 contracts.
5. In Jan 2000, buy back both Jan 00 contracts and sell two March 00 contracts.
6. In early March, buy back both March 00 contracts and sell one May 00 future.
7. In May, buy back May contract and sell one July contract
8. In July, buy back Jul contract and sell one Sept 00 contract
9. In Sept, buy back Sept contract and sell one Nov 00 contract
10. In Nov, buy back Nov contract and sell one Jan 01 contract
11. In Jan 01, buy back Jan contract and sell one March 01 contract
12. In early March, buy back the March 01 contract to close out hedge.

• Rollover Strategy #2:

1. In June 1999, sell four July 1999 contracts.
2. In July 1999, buy back all July contracts and sell four Sept 99 contracts
3. In Sept 1999, buy back all Sept contracts and sell four Nov 99 contracts
4. In Nov 1999, buy back all Nov contracts and sell four Jan 00 contracts.
5. In Jan 2000, buy back all Jan 00 contracts and sell four March 00 contracts.
6. In early March, buy back all March 00 contracts and sell three May 00 futures.
7. In May, buy back May contracts and sell three July contract
8. In July, buy back Jul contracts and sell three Sept 00 contract
9. In Sept, buy back Sept contracts and sell three Nov 00 contract
10. In Nov, buy back Nov contracts and sell three Jan 01 contract
11. In Jan 01, buy back Jan contracts and sell three March 01 contract
12. In early March, buy back March 01 contracts, and sell two May 01 contracts.
13. In May, buy back both May contracts and sell two July 01 contracts
14. In July, buy back both July contracts and sell two Sept 01 contracts
15. In Sept 01, buy back both Sept contracts and sell two Nov contracts
16. In Nov 01, buy back both Nov contracts and sell two Jan 02 contracts
17. In Jan 02, buy back both Jan contracts and sell two Mar 02 contracts.
18. In March, buy back both March contracts and sell one May 02 future
19. In May, buy back May contract and sell one July future
20. In July, buy back July contract and sell one Sept contract
21. In Sept, buy back Sept contract and sell one Nov 02 contract
22. In Nov, buy back Nov contract and sell one Jan 03 contract
23. In Jan 03, buy back Jan contract and sell one March 03 future.
24. In March 03, buy back March contract to close out hedge.

• Rollover Strategy #3:

1. In March 2000, sell one May 00 contract.
2. In May, buy back May contract and sell one July contract
3. In July, buy back Jul contract and sell one Sept 00 contract
4. In Sept, buy back Sept contract and sell one Nov 00 contract
5. In Nov, buy back Nov contracts and sell one Jan 01 contract
6. In Jan 01, buy back Jan contract and sell one March 01 contract
7. to close out hedge.

- **Rollover Strategy #4:**

1. In March 2001, sell one May 01 contract.
2. In May, buy back May contract and sell one July 01 contract
3. In July, buy back July contract and sell one Sept 01 contract
4. In Sept 01, buy back Sept contracts and sell one Nov contract
5. In Nov 01, buy back Nov contract and sell one Jan 02 contract
6. In Jan 02, buy back Jan contract and sell one Mar 02 contract.
7. In March, buy back March contract to close out hedge.

- **Annual rollover:**

1. In June 1999, sell one July 1999 contract.
2. In July 1999, buy back all July contract and sell one Sept 99 contract
3. In Sept 1999, buy back all Sept contract and sell one Nov 99 contract
4. In Nov 1999, buy back all Nov contract and sell one Jan 00 contract.
5. In Jan 2000, buy back all Jan 00 contract and sell one March 00 contract.
6. In early March, buy back all March 00 contract and sell one May 00 future.
7. In May, buy back May contract and sell one July 01 contract
8. In July, buy back Jul contract and sell one Sept 00 contract
9. In Sept, buy back Sept contract and sell one Nov 00 contract
10. In Nov, buy back Nov contract and sell one Jan 01 contract
11. In Jan 01, buy back Jan contract and sell one March 01 contract
12. In early March, buy back March 01 contract, and sell one May 01 contract.
13. In May, buy back both may contract and sell one July 01 contract
14. In July, buy back both July contract and sell one Sept 01 contract
15. In Sept 01, buy back both sept contract and sell one Nov contract
16. In Nov 01, buy back both Nov contract and sell one Jan 02 contract
17. In Jan 02, buy back both Jan contract and sell one Mar 02 contract.
18. In March, buy back both March contract and sell one May 02 future
19. In May, buy back may contract and sell one July future
20. In July, buy back July contract and sell one Sept contract
21. In Sept, buy back Sept contract and sell one Nov 02 contract
22. In Nov, buy back Nov contract and sell one Jan 03 contract
23. In Jan 03, buy back Jan contract and sell one March 03 future.
24. In March 03, buy back March contract to close out hedge.