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Commodity Exchanges and Market Development: What Have we Learned?[1]

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ABSTRACT

Improving price discovery, linking smallholders to markets, reducing transactions costs, and increasing agricultural export earnings are some of the popular claims about benefits of Agricultural Commodity Exchanges (ACX) in developing countries. Based on the case studies, and a review of available literature, this paper examines the validity of these popular claims and associated public policies. Our analysis suggests that most of these popular claims cannot be supported by empirical evidence. While agricultural commodity exchanges have been successful in emerging countries, they have either failed or remain in operation with government or donor supports. Underlying reasons for the failures, considerations for future investments in such institutions, and implications for alternatives to centralized exchanges are discussed.

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1. Introduction

A commodity exchange is a centralized location where buyers and sellers carry out transactions, with or without physical commodities, under a set of clearly defined rules and regulations. In theory, commodity exchanges can contribute to market development by reducing transactions costs, improving price discovery, and reducing price risks. Coordinating through a centralized exchange reduces the costs associated with identifying market outlets, physically inspecting product quality, and finding buyers or sellers. In fact, commodity exchanges have historically evolved through private initiatives to address the high cost of doing business in spot markets (Black, 1986; Garcia and Leuthold, 2004). Exchanges can be privately profitable when market actors are willing to pay for three important services: (i) improving price discovery, (ii) increasing market liquidity, and (iii) helping price risk management. Price discovery improves because true scarcity value of a commodity is revealed through bidding of buyers and sellers that exchanges bring together at their floors. Liquidity constraints are eased through well-functioning warehouse receipt system (WRS) or inventory credit systems, which are generally integral parts of commodity exchanges (Larson et al, 2004; and Coulter and Shepard, 1995). Finally, when contracts for future delivery are traded, commodity exchanges can contribute to both strengthening market liquidity and facilitating price risk management (Black, 1996; and Leuthold, et al. 1989).

Despite the potential benefits, organized commodity exchanges remained confined to industrialized countries for more than a century. In many countries, exchanges failed to emerge as privately profitable entity either because of underlying market failures or due to heavy government interventions in commodity markets. This situation began to change with the onset of the structural adjustment programs in the 1980s and the early 1990s, which involved liberalization of commodity markets and dismantling of marketing boards. During this time, commodity exchanges were viewed as a market-based solution to price risks and other market failures. Indeed, the growth of commodity exchanges in developing countries has been so significant since the 1990s that the majority of the world's functional commodity exchanges are now located outside of North America and Europe. Non-OECD countries accounted for more than 50 percent of the agricultural futures and options traded in the world in 2005 (UNCTAD, 2007).

However, this was largely driven by the emerging economies of China, India, Brazil, Malaysia, and South Africa. In developing countries, there have been several government-led and donor-funded initiatives to establish agricultural commodity exchanges. In Sub-Saharan African countries, the outcomes of these investments have been mixed at best and are very poorly documented. Available information suggests that, with the exception of South Africa, no other African country has been successful in launching viable private

sector-led exchanges. Three different attempts to set up agricultural commodity exchanges in Zambia failed (Sitko and Jayne, 2012); despite initial success, Zimbabwe's exchange had to close its doors due to government interventions (AfDB, 2013); and exchanges in Kenya, Malawi, Nigeria, and Uganda exist only on paper with donor and government support (Rashid et al., 2010). The Ethiopian Commodity Exchange (ECX) — another government-led and donor-funded exchange — is widely regarded by the popular media as a success story, but there is little rigorous research to substantiate many of the popular claims. By contrast, commodity exchanges in Asia in the past few decades have largely been in the emerging economies and, while some are government-controlled, none are donor-funded. However, in terms of documenting experiences, Asian countries do not seem to fare any better than Africa. Therefore, while governments and donors continue to support setting up commodity exchanges, there remains large knowledge gaps in both continents.

The objective of this paper is to fill that knowledge gap. It assembles evidence from literature and undertakes some simple analysis to assess the validity of many popular claims about the success and benefits of commodity exchanges in developing countries, with special focus to African countries. The hope is that this will serve as a framework with which to evaluate both ongoing and future government-led and donor-funded commodity exchanges initiatives. The rest of the paper is organized as follows. Section 2 presents a brief overview of the world's agricultural commodity exchanges. The viability conditions and impacts of agricultural commodity exchanges on market and household wellbeing are discussed in Sections 3 and 4, respectively. Alternative options to setting up domestic commodity exchanges are discussed in Section 5; and the paper concludes with a summary and implications for policies and research.

2. Overview of Worlds' Commodity Exchanges

This section summarizes several key features of existent agricultural commodity exchanges in the world. The main source for this overview is UNCTAD's periodic reports on the state of agricultural commodity exchanges. A summary of the world's leading exchanges, with their key features, are presented in Table 1, which shows that there are wide variations among leading agricultural commodity exchanges with respect to the history, ownership, contracts traded, and operational status. With regards to history, we see that commodity exchanges were confined to industrialized countries until the onset of structural adjustment programs in the 1980s and 1990s; the exceptions to this were Brazil and Argentina, which established organized commodity exchanges long before their economies began growing and Malaysia, whose exchange was established for the sole purpose of trading crude palm oil.

An important implication of Table 1 is that commodity exchanges now operate under a wide range of ownership, political economy conditions, and farming systems. Brazilian exchanges were government-owned until the mid-1960s and became for-profit only in 2007. Similarly, China's DaLian Commodity Exchange (DCE) operates under government control, primarily serving domestic markets. Ethiopia, Malaysia, Thailand, and Brazil now have exchanges operating under the public-private partnership model. Similarly, there are exchanges in both open and restrictive political and economic systems, smallholder-dominated agriculture (e.g. Ethiopia and China), a mixture of large and smallholders (e.g., South Africa and Thailand), and large-scale farming (North America and Europe).

Finally, with regards to operational status, while exchanges established since structural adjustment have been successful only in the emerging economies (China, India, Brazil, Thailand, etc.), most exchanges in Africa's developing countries have either failed or continue to exist only on the paper with government or donor support. Examples include exchanges in Kenya, Malawi, Nigeria, Uganda, Zambia, and Zimbabwe. Further details on the success and failure of these exchanges are provided below; we considered exchanges to be successful if they: i) conduct trade and ii) generate enough revenue to profitably pay for their operations. Again, the Ethiopian Exchange (ECX) is an exception in that, although it generates enough revenue to pay for itself, it only does so with direct policy support, which requires all export commodities to go through the exchange.

The summary information in Table 1 leads us to two important areas of investigation. First, the fact that some exchanges succeeded and some failed suggests that there is a need for a better understanding of the viability conditions under which an exchange can be successful. This has important policy implications. If exchanges are privately profitable, then it is private sector's responsibility to assess viability for making their investment decisions. However, if exchanges are supported by the government and donors, it is necessary to assess the underlying viability conditions. There may be countries in which exchanges are not privately profitable due to policy bottlenecks. There are also countries in which exchanges are not profitable because they do not satisfy other viability conditions. In either case, the situation calls for a viability assessment to be done before investing public funds in the establishment of commodity exchange, with appropriate monitoring and evaluation mechanisms if an exchange is established. The other important area to be investigated is how exchanges contribute to market development and improve smallholders' livelihood — a commonly used argument for supporting agricultural exchanges in the developing countries. Here we look at the literature on both developed and emerging countries and conduct simple analysis to examine the validity of many claims regarding the positive impacts of exchanges in Africa.

3. Viability Conditions for Successful Commodity Exchanges

3.1. Highlights from the literature

Black (1986) presents a list of comprehensive pre-conditions for setting up successful commodity exchanges. This study deals mainly with developed countries, but most of the conditions are applicable to developing countries as well. The list of viability conditions in the literature can be grouped into four broad categories: i) commodity-specific conditions; ii) effective regulatory environments; iii) contract-specific conditions; and iv) other enabling conditions. In addition to these, there are several policy related conditions, such as exchange rates policies, trade bans, and agricultural price policies, that are critical for the successful establishment of commodity exchanges (Rashid et al 2010). Table 2 summarizes these key viability conditions with an assessment of whether they are present in some of most successful agricultural commodity exchanges—defined in terms of trade volumes and profitability--in the world. The source of information for the four exchanges in the emerging economies is UNCTAD (2009)[2] and the remainder are based on a review of the literature.

In setting up commodity exchanges, commodity-specific conditions should be assessed first. Generally, transactions fees at these exchanges are small and therefore, unless volumes are large, an exchange may not generate enough revenue to pay for itself. A large volume of trade serves two other important purposes; it helps generate sufficient commissions to cover the costs of running the exchange and it helps reduce the probability of collusion and market manipulations. Two other commodity-specific conditions are product homogeneity and Grades and Standards (G&S). These attributes allow market actors to move from personal interaction based transactions (knowing market actors, physically inspecting commodities, etc.) to impersonal transactions carried out under commodity exchanges. In other words, for commodity exchanges to work, all market actors (the traders, bankers, and warehousing facilities) have to have trust in the system; one of the pre-requisites for establishing such trust is establishing G&S.

Even if the commodity-specific conditions are met, an agricultural commodity exchange cannot sustain itself unless the country has effective regulatory systems. Two examples can illustrate this point. When the Chicago Board of Trade was launched in 1864, British India had a very large market for all of the commodities that Chicago was trading. Therefore, it was not a surprise that India launched its first organized exchange in 1875, which initially traded cotton contracts and subsequently added oilseeds, wheat, jute, and bullion. Smaller exchanges popped up in various parts of the country, but by 1920, the government became suspicious of the exchanges' role in price spikes and market manipulation. Therefore, laws were passed prohibiting future trades — initially bans on food crops in 1935 and then bans on many other commodities

[2] Annex Table 2 and discussion on pages 21-22

after India's independence (Dhole, 2014). A more recent example of regulatory failure is the agricultural commodity exchange in Zimbabwe, where a private sector-led exchange, called the Zimbabwe Agricultural Commodity Exchange (ZIMACE), was set up in 1994 and operated successfully for six years. While it was more active in maize and wheat, ZIMACE also offered standardized contracts for oilseeds, beans, and cotton. It was widely seen as a success, with total trade value reached US$500 million, but the government became suspicious of the exchange's role in commodity markets and suspended its operation in 2001 (AfDB, 2013).

Two questions are pertinent for both country cases. Were suspicions of market manipulation legitimate? And could these governments have avoided closing down the exchanges? The answer to the first question is perhaps yes. The available literature suggests that commodity futures have been accused of market manipulation numerous times, from their early years to as recently as in the 2007-2008 global food crisis. Markham (1991) provocatively titled an article *Manipulation of Commodity Futures Prices - The Un-prosecutable Crime*, and a recent *Foreign Policy* article begins with this statement: "*Don't blame American appetites, rising oil prices, or genetically modified crops for rising food prices. Wall Street is at fault for the spiraling cost of food"* (Kaufman, 2011). This article accuses a large Wall Street company, Goldman and Sachs, for increasing prices through an investment product called Goldman Sachs Commodity Index (GSCI), which is a derivative that tracked 24 products including coffee, cocoa, corn, soy, and wheat. Arguably, GSCI contributed to prices because of de-regulation, which allowed bankers to take as large a position in grains as they liked; since the Great Depression, this option was available only to those who actually had something to do with production. This much is clear from these two articles: suspicions of market manipulation through commodity futures are pervasive in the USA. However, the fact that all US exchanges are in operation suggests that the regulatory systems have somehow worked to address the problem. Could India and Zimbabwe have addressed their suspicions with regulation instead of prohibiting exchange altogether? This question is beyond the scope of this paper; however, given that India now has thriving exchanges, including three that are among top 20 exchanges in the world (UNCTAD, 2006), one can argue that the country now has more confidence in its regulatory systems than it did in the early years of its independence.

For a developing country, having an effective regulatory authority is a tall order. The tasks that a regulatory agency needs to perform require strong governance and a high level of human capacity and technical skill. There are three key functions that a regulatory authority needs to perform for an effective exchange: i)

protecting investors; ii) ensuring fairness and transparency; and iii) reducing systemic risks.[3] The first two are related to addressing moral hazards problems. While executing trade for their clients, exchanges and their members might engage in irresponsible or unscrupulous behavior, including collusion, misappropriation of clients' funds, or use of clients' funds for their own interests or business. A regulatory authority must be effective enough to address these challenges. Ensuring fairness in the market is another serious challenge, requiring free and transparent dissemination of information, constant monitoring of activities for suspicious trade patterns, and setting position limits on speculative participants. Reducing the systemic risks is related to problems lying largely outside of the exchanges themselves. When an economy-wide shock is experienced, the regulators' role is to reduce the risk of default, ensuring that the exchange is resilient enough to withstand shocks revealed in excessive volatility. In some developing countries, especially those with weak governance, performing these tasks can be insurmountable, and setting up successful exchanges may be near impossible.

The third viability condition relates to the contracts. The existing literature presents several cases in which exchanges failed or contracts had to be revised to keep the exchanges running (Gray, 1966). A fundamental condition is that the contracts, and the incentives they embody, must be balanced between buyers and sellers. In turn, studies suggest that a balanced contract can be devised only when cash markets are well functioning. Empirical studies of the US markets by Black (1986) and Bronsen and Fofana (2001) found that an active cash market is the primary condition for the success of a new contract. An active market facilitates the definition of contract terms that are balanced and provides a clear assessment of basis risk. Another recent study suggest that the di-ammonium phosphate (DAP) futures contract in the Chicago Board of Trade ultimately failed because the cash and futures markets were not sufficiently linked, making it a poor hedging tool that offered no additional risk management support (Bollman, et al., 2003). This example demonstrates the difficulty of providing a functional, balanced contract even when the infrastructural, macroeconomic, and institutional environments are hospitable. Will contract-specific conditions be binding for the developing countries? Perhaps not. Many developing countries have large and active cash markets, especially for cereals and export crops; there is also a large body of literature showing that markets in developing countries have become increasingly integrated following market liberalization.

The final viability condition is having enabling conditions with regards to physical infrastructure, financial infrastructure, and macroeconomic stability. There is little doubt that the successful exchanges listed in Table 2 satisfy these conditions. However, examining the historical contexts, one can argue that physical

[3] These functions are specified in a 2003 document of the International Organization of Securities Commission (IOSCO, 2003).

and financial infrastructure may not be the real binding constraints for developing countries in the 21st century. When the US launched its exchanges in 1864, the physical and financial infrastructures were not any better than what many developing countries have today. Perhaps more relevant is the Indian example. When India launched its first organized exchange in 1875, physical and financial infrastructures were certainly not at the levels that many Least Developed Country (LDCs) have today. Macroeconomic stability, however, remains central; setting up an exchange in an environment of unstable macroeconomic environment is not only doomed to fail, but may also disillusion market actors and be counter-productive to development (Leuthold, 1994, McKinnon (1991). In allocating funds, from either governments or donors, for setting up an exchange, this last condition should be taken seriously. It is particularly important to check whether a country has viable currency and sound policies for monetary management, exchange rates, and foreign trade.

3.2. Experiences with Exchanges in Sub-Saharan Africa

Following the structural adjustment programs, governments and donors have generously supported commodity exchanges in Africa. By the late 1990s, five countries in Sub-Saharan Africa had established commodity exchanges (Kenya, Uganda, South Africa, Zambia, and Zimbabwe); most of them, except South African and Zimbabwe, received government and donor support. Since then, Ethiopia, Malawi, and Nigeria have also invested in setting up exchanges, and following ECX success stories in the media, more African countries are now expressing interest in setting up exchanges. Rwanda set up the East African Exchange (EAX) in 2013, Tanzania is now in the process of setting up its own exchange, and Nigeria is making large investments in upgrading its warehouse infrastructure to facilitate a future exchange. In a recent Forbes magazine interview, the founding CEO of the Ethiopian Commodity Exchange (ECX), who now runs a company that offers advisory services to other countries, reported that there might be as many as 10 more agricultural commodity exchanges on the continent.[4] We ask two questions in this context: i) what have been the experiences with the government- and donor-funded agricultural commodity exchanges in Africa; and ii) how robust is the empirical basis of the ECX success stories that fueled renewed interest in setting up exchanges in Africa?

In documenting the African experiences, a key challenge was a lack of available research. To our surprise, with the exception of Ethiopia, there was no publicly available document making the case for setting up commodity exchanges. This is particularly surprising because most of these exchanges were government-

[4] The Forbes article, available at http://www.forbes.com/sites/skollworldforum/2013/08/15/africas-agriculture-commodity-exchanges-take-root/, provides more details about increasing enthusiasm about the agricultural commodity exchanges following the ECX.

or donor-funded. Our approach has been to gather as much information as possible from the gray literature, stories in the popular media, and personal communications. Our objective is to provide an account of the successes and failures of these exchanges and to draw lessons for the future. A summary of the information we have gathered with respect to ownership and viability conditions is presented in Table 3. We strive here to understand the relevance of these viability conditions in the context of Sub-Saharan Africa. However, we also briefly discuss the contextual information with regard to funding support, suspensions and re-emergence, as well as future prospects.

With regard to funding sources, the exchanges in Table 3 can be grouped into three broad categories: i) private sector-led exchanges (Zambia and Zimbabwe); ii) government- and donor-supported exchanges (Kenya and Uganda); and iii) exchanges run through donor support plus own revenue (Malawi, Nigeria, and Ethiopia). Even though it was one of the early movers, ownership of commodity exchanges in Zambia changed from private sector to private-public with donor supports. The first exchange was set up the by the Zambia National Farmers Union and Commodity Research Institute in June 1994. Following the success of this exchange, two more were established in 1997 — one in the central province and the other in the eastern province. However, all three suspended their operations by early 2000, arguably due to heavy government intervention (AfDB, 2013). Zambia's final attempt was in 2007, when a group of 15 grain traders and brokers established ZAMACE as a non-profit open outcry exchange with some donor support. It was in operation until 2010 and, according to available trade volume data, it traded about US$36 million worth of commodities in 2009; however, the revenue generated by the exchange was not enough to pay for its operation, which closed its doors in 2011.

Zimbabwe's ZIMACE was also a private sector-led exchange that successfully operated for more than five years after its launch in March, 1994. It provided a platform for negotiating standardized contracts linked with ZIMACE warehouse receipts. While it was more active in maize and wheat, ZIMACE also offered standardized contracts for oilseeds, beans, and cotton. It was widely seen as a success, with its total trade value reaching US$500 million in 2001, the last year of its operation, despite the many political challenges it faced (AfDB, 2013).

A key lesson from these two countries is that political stability and limited government intervention in markets are central to the viability of an agricultural commodity exchange. This is particularly true for Zimbabwe, where market size was large enough and the private sector-led exchange was self-sustaining. Assuming a transaction fee of 0.2%, ZIMACE generated a total revenue of US$1.0 million in 2001, which appears to be sufficient for running an exchange in a developing country. The case of Zambia is not as straightforward. It's maximum trade value during its last stint of operation was US$36 million, which,

assuming a 0.2% commission, translates to a total revenue of US$72,000. More importantly, available studies suggest that WFP supported both Zambia's and Malawi's exchanges based on the argument that facilitating aid procurement would contribute toward market development (IIED, 2011, Robins, 2010).

Both Kenya and Uganda began their exchange operations in 1997. While these exchanges do not trade on their floors, they continue to provide some market services for which they received donor support. Currently, their limited role includes providing price information in Kenya and regulating some warehouses on behalf of the government in Uganda. Both of these exchanges were supposed to be private sector-led, but they encountered problems immediately after their launch; both needed funds to cover their operating costs, as they could not attract any trade. In Uganda, the government covered the operating costs until 2006, when UCE received a large grant from the European Union to promote electronic Warehouse Receipts. In 2008, UCE estimated that it would need 22 warehouses, each with a capacity of 5000 tons, to break even. As of December 2010, it had six licensed warehouses, one warehouse under renovation, and one under construction (Alia, 2010).[5] As of 2012, UCE had issued electronic Warehouse Receipts for 9,000 tons of grain, and the United Nation's World Food Program (WFP) is becoming one of its largest buyers. UCE is still far behind its targeted volume and will likely continue to need donor support. This is also true for KACE, which has relied on donor support for its operating costs since its inception, estimated to be US$50,000 (AfDB, 2013).

Of Africa's three other operating exchanges, Nigeria's exchange has a running website with little, or dated, trade information; Malawi's exchange trades a small amount but relies on donor support for its operating costs. Malawi has three different commodity exchange initiatives. The first was called Agricultural Commodity Exchange (ACE) for Africa, which was initiated by the National Smallholder Farmers' Association of Malawi with financial support from the USAID in 2004. In 2006, the Malawi Agricultural Commodity Exchange (MACE), modeled after KACE, was launched. This exchange tried an interactive radio program, called Super Market on the Air, through which farmers and traders could place orders on live radio. While it was an interesting idea, it never received much take-up and eventually closed its doors. The last exchange is an initiative by Auction Holding Limited (AHL), Malawi's largest tobacco company, which is partly owned by the government. It was expected to be officially launched in 2013, and there is very little information or data available about it.

It is difficult to draw any definitive conclusion regarding these exchanges' viability conditions. Looking at trade volumes, it becomes immediately clear that these exchanges' volumes are small. To date, only Malawi

[5] This is based on a UCE power point presentation available at: http://www.unctad.info/upload/SUC/EcowasGhanaCerealMarkets/Presentations/Ecowas_Uganda_Presentation_en.pdf

and Ethiopia actively trade on their floors. In 2012, Malawi's ACE traded about US$9.0 million worth of commodities, with the WFP accounting for about 60% of the total trade. Given its commission rate of 0.2%, this means that ACE made about US$18,000 in 2012, which is very small for exchange to be self-sustaining. Therefore, even though it generates some revenue, ACE cannot continue its operation without government or donor support. In terms of trade value, the Ethiopian Commodity Exchange can be considered a developing country success story; it generated over US$1.0 billion in revenue in 2012, which is large enough to pay for its own operations. Given that ECX charges a commission of 0.2%, this implies that it generated about US$2.0 million, which is a respectable amount of revenue. However, it is important to understand that although the ECX was launched in 2008 with a mandate to trade cereals, it was soon realized that its trade volumes were insufficient. In late 2008, the government therefore passed a proclamation requiring all coffee and other export crops grown in Ethiopia to be exported through the ECX. At one point in late 2008, the government had to confiscate 17,000 tons of coffee from 80 exporters attempting to bypass the ECX.[6]

Therefore, it is unclear whether the ECX would have enjoyed its success without government intervention; indeed, it is also unclear what the offsetting costs might be to the benefits of establishing the ECX. More importantly, since the agricultural export value of each of the countries in Table 3 exceeds at least one billion US dollars, all of these countries could have made their exchanges self-sustaining had they adopted Ethiopian model — that is, required all export commodities to go through the exchange. However, the key policy debate is the justification for placing policy restrictions on markets for promoting commodity exchanges. We did not find any studies justifying the establishment of commodity exchanges on the grounds of market failure. In fact, quite the contrary argument is common in the literature. In an early study, Working (1953) argued that "commodity futures trading, like banking, is an institution that evolved as a contribution to efficiency of relatively free and competitive markets." In a similar vein, Leuthold (1994) stated that commodity futures markets had never been imposed on societies by government decree; instead, they grew from existing spot markets because of their incompleteness.

Two other viability conditions that need further discussion are exchange rate policies and regulatory effectiveness. According to the International Monetary Fund (IMF) database, exchange rate regimes in most counties in our sample are listed as managed floating exchange rate policies. The exceptions are Uganda and Zimbabwe, with floating exchange rates and no legal tenders, respectively. Experiences from China and India suggest that exchange rate policies may not be a binding constraint as long as domestic markets are large and policies are predictable. For instance, China frequently makes media headlines for its

[6] For detail, see the BBC report at: http://news.bbc.co.uk/2/hi/7964146.stm

exchange rate policies, while India continues to have managed floating exchange rate policies. Yet both countries have large and active agricultural commodity exchanges.

The situation is different if a country is import-dependent, which has been the case for most of the countries in Table 3. A general tendency in these countries is to overvalue the exchange rates, which can lead to balance-of-payment problems and uncertainties for the private sector. This reality was sadly manifested in Ethiopia in late 2008. When it became clear that the ECX could not attract sufficient volumes of cereal, which is what the exchange was originally set up to trade, the government dismantled the age-old coffee auction floor and passed a law requiring all coffee grown in Ethiopia to be traded through the ECX. The government's argument was that a few exporters were cornering the market to the detriment of smallholders. However, exporters were reluctant to bring their coffee to the exchange floor because they expected a devaluation. Moreover, following the increase in oil prices in 2007 and early 2008, the Ethiopian economy experienced major shocks, which resulted in foreign exchange shortages and balance-of-payment problems. In order to avoid excessive draw-down of foreign exchange reserves, the government instituted foreign exchange rationing in March, 2008 (Dorosh and Ahmed, 2009). A decline in coffee exports further exacerbated the foreign exchange shortages, which perhaps partly explains why the government confiscated around 17,000 tons of coffee from around 80 exporters (BBC, 2009).

In recent years, Malawi confronted similar challenges with its exchange rates. Malawi's government resisted devaluating the currency despite withdrawal of budget support by its development partners, resulting in a serious balance-of-payment problem in recent years. Pauw, et al. (2013) reports that Malawi would have experienced 1.5% higher growth in GDP and a 6.9% reduction in poverty without such policies. If Malawi had followed a strategy similar to Ethiopia's for the promotion of agricultural commodity exchanges, we would probably have seen another BBC report similar to the one on Ethiopia on government intervention. We have not explored the relevance of macro and monetary policies in other countries, but it is very likely that one can come across similar stories in other import-dependent developing countries.

4. Agricultural Commodity Exchange and Developmental Impacts.

Evidence of the impacts of agricultural commodity exchanges in the industrialized world are drawn from evaluations of improvements in market performance. These studies fall under three broad categories: price behavior, hedging, and institutional determinants of success and failures. Each of these broad categories have sub-categories; for example, three distinct areas of empirical investigation underprice behavior are price discovery, long-term market efficiency, and price volatility. Portfolio analysis for hedging, analysis of econometric relationships between spot and future prices, and event and price discovery analyses have

existed for a long time. In most of these cases, empirical analyses depended on time series models; the results are summarized in Table 4 below. Garcia and Leuthold (2004) provide an extensive review of earlier empirical research in industrialized countries, but any reference to impact evaluation on income or broader developmental impacts of commodity exchanges in low income countries is completely absent. A recent UNCTAD report puts it squarely when it states "…..as far as known, no systematic or empirical study has been conducted on the developmental impacts of commodity exchanges in the emerging countries (UNCTAD, 2009, p. 6)."

The current review confirms this finding and did not find any study that establishes causality and impacts on household welfare or other development metrics at the household level with any level of rigor, including quantitative methods such as Randomized Control Trials (RCT), matching, or other survey-based econometric methods.[7] As a result, claims about the impacts of commodity exchanges in developing countries cannot be substantiated in an econometrically valid manner. Similar to findings in developed countries, available studies from emerging countries do document positive impacts of commodity exchanges on price discovery (Table 4), which can imply — at least in theory — market development and perhaps even benefits to the overall economy. Here also, however, there is a gap in the research.

This section summarizes key insights from three main sources: i) time series econometric studies on the impact of commodity exchanges on market variables, primarily in China, India, and Brazil; ii) a descriptive 2009 UNCTAD study on the developmental impacts of commodity exchanges in emerging countries based on subjective rankings; and iii) some assessment of African experiences using secondary data.

4.1. Results from Time Series Econometric Analysis

Empirical studies assessing the functioning of commodity exchanges mainly rely on time series econometric methods. Most of these studies use high frequency price data and trade volume data to test whether exchanges are in fact improving price discovery and market integration. Improving price discovery means that buyers and sellers can bid to determine prices based on transparent market information. In a developing country, this implies that smallholders can negotiate better prices for what they produce and that no particular actors in the value chain can influence prices. Better market integration, on the other hand, implies that prices get transmitted efficiently across space and stages of the value chain. For instance, if the world market price of an exportable commodity goes up, the information will get quickly transmitted to the

[7] One study (Fafchamps and Minten, 2012) has used RCT to assess the impacts of price information on Indian farmers, where one group of farmers received information from a private company (treatment group) and a similar group did not (control group). This study did not find any statistically significant impacts between the control and treatment groups based on the following indicators: the price received by farmers, crop value-added, crop losses resulting from rainstorms, and cultivation practices.

value chain actors in exporting countries. In other words, the benefits of price increases cannot be reaped by any particular market agent due of superior information. The price difference between two market locations would be equal to the transaction costs (transportation, storage, and other trade costs).

Commonly used methods are vector error correction (VEC), co-integration, and Granger Causality tests. Table 4 summarizes some recent studies for both developed and emerging countries and suggests that there are three broad strands of analysis. The first strand of analysis focuses on examining the relationship between spot and future prices to test whether exchanges are performing price discovery functions. The underlying idea is simple: if prices reflect the true scarcity values, there should not exist large (and persistent) deviations in the spot and expected future prices. The second strand of analysis focuses on whether future prices are influenced by current prices and vice-versa. This is accomplished by conducting Granger causality tests. The third strand of analysis examines the relationship between trade volumes and price volatility. This became particularly relevant in the context of the 2007-2008 global food crisis, when many argued that excessive trading created high volatility which was in turn transmitted to world markets (von Braun and Torero, 2009; and Hernandez, 2010).

Table 4 draws on peer-reviewed journal articles on India, the US, South Africa, Brazil, and China. For the Indian exchange, Easwaran and Ramasundaram (2008) assessed the price discovery hypothesis using MCX exchange data for four commodities (cotton, castor, pepper, and soy). The study uses restricted OLS to test price discovery and volatility transmission. The price discovery hypothesis is tested by examining whether or not spot and future prices deviate significantly; volatility transmission is tested by examining the variance of the difference between spot and future prices. They did not find improved price discovery, nor did they find that the MCX affects volatility. Chhajed and Mehta (2013) have analyzed the prices of nine different commodities to examine price discovery and market performance. They used vector error correction and Granger Causality tests. The analysis, however, suffers from a number of weaknesses, and the results are mixed. The study does not conduct any routine diagnostic tests for the time series (e.g., unit root tests, lag length, residual normality); therefore it is not clear whether the authors have estimated the right model. Also, Granger causality tests are very sensitive to assumptions about the time series and about what variables are included as explanatory variables. The paper has no discussion and presents no tabular results on these issues, so the results should be treated with caution. The final study on India by Shehgal et al. (2013) draws finds strong evidence of price discovery in the sense that spot and future prices are co-integrated for eight of the 12 commodities they analyzed. With respect to the other emerging countries — South Africa, China, and Brazil — the studies find strong evidence of price discovery and market efficiency. The study on China's DCE (Zheng et al., 2012) focuses on one commodity, non-GMO soybeans, and presents strong evidence that future prices are influenced by exogenous shocks and that cash and future

prices are integrated. This can be taken as an indication of better price discovery and a well-functioning exchange. The results of this study differ from earlier studies, which raised concerns in the Chinese government about the role of commodity exchanges. This later study makes the important point that the DCE has matured and is playing a much stronger role now. For instance, a comparable earlier study (Wang and Ke, 2005) argued that China's soybean markets suffered from over-speculation and that its future trading was not efficient. However, that study relied on old data gathered when the DCE was evolving.

The study on the South African exchange (SAFEX) by Phukubje and Moholwa (2005) used about nine years' worth of data to test price discovery for wheat and sunflower seeds in SAFEX. The study presented two sets of seemingly conflicting results. First, it showed that there is a significant relationship between spot and future prices, implying improved price discovery due to the exchange. Given that SAFEX has profitably existed for more than a quarter of a century without any support, this result is to be expected. Traders and farmers voluntarily traded their commodities through SAFEX because it benefitted them by reducing their transactions costs, which in turn improved market performance. However, the study also reported that brokerage fees can make trade unprofitable, which is counter-intuitive given SAFEX's long - standing operation.

The study on Brazil by Mattos and Garcia (2004) investigates price discovery and the link between trade volume and price volatility using price and trade volume data for six commodities (coffee, corn, cotton, live cattle, soybeans, and sugar). They find that the heavily traded commodities (coffee, cattle, and sugar) exhibit evidence that the exchange performs the price discovery functions, while the more thinly traded commodities exhibited no or weak integration. Overall, the study argued that the level of market activity necessary to develop interactive cash and futures markets is small for most commodities and confirms that exchanges do perform the price discovery function.

There are many studies on US commodity exchanges; we have selected a relatively recent study (Yang and Latham, 1999) that used advanced econometrics to provide indicative results. This study analyzes price discovery functions for three US wheat futures markets in three major exchanges: the Chicago Board of Trade, the Kansas City Board of Trade, and the Minneapolis Grain Exchange. The central hypothesis of this paper is that the futures markets search more for information than cash markets to find an equilibrium price, thus greatly improving the price discovery function. The tests reveal the existence of one equilibrium price across the three futures markets in the long run, implying a strong price discovery function.

Another important analysis that this study undertook was testing the relative importance of each of the exchanges in the overall price formation. The logic of this econometric test is to determine whether one of the three exchanges dominates the process of price determination. The results of the test suggested that the

Kansas exchange was the main driver of the formation of future wheat prices in the US. Based on this result, the authors drew two important implications: i) the US probably does not need three exchanges for wheat and ii) even if three exchanges exist, traders in the US wheat market should pay more attention to Kansas future prices when making their trade decisions. In our view, the first conclusion is premature in that if the other two exchanges are closed down, there might be a risk of monopoly and manipulation.

4.2. Developmental Impact Analysis by UNCTAD

While donors have supported the establishment of agricultural commodity exchanges, the articulation of developmental impacts remains mainly theoretical and has not been formally assessed. UNCTAD (2009) made the first documented attempt to do so, with a focus on emerging economies. The study adopted a four-step methodology. The first step involved the identification of the potential benefits of commodity exchanges. Based on the review and the judgment of the researchers, six potential beneficial functions were identified, of which three (price discovery, hedging, and venue for investment) are considered core functions and the rest (facilitation of physical trade, financing, and market development) are considered secondary benefits. In the second step, a set of hypotheses was developed about the benefits accruing to each of the core functions. In the third step, a range of impact hypotheses were developed for each of the benefit hypotheses. This yielded a total of 81 impact hypotheses, 37 pertaining specifically to farmers and the rest pertaining to the commodity sector in general. While this provides a welcome analytical framework for a vastly under-researched area, the final step of evaluating the hypotheses does not establish causality or attribution, and the methods are more descriptive than rigorous. The UNCTAD study uses both qualitative and quantitative data compiled by conducting surveys gathered from secondary sources to assess the 81 hypotheses but it has no control or identification methods to establish causality. For example, the study finds a positive impact on 30 of the 37 farmer-related hypotheses but is unable to establish whether income increases or better price information were due to the exchange. While the results cannot be taken as evidence for the impact of commodity exchanges, therefore, they nonetheless provide a much needed context and basis for more rigorously designed research.

4.3. Evidence from Commodity Exchanges in Africa

Given the documented benefits of commodity exchanges on price discovery and market development in the peer-reviewed literature and the hypothesized impacts on farmers and welfare, it is easy to understand the renewed interest in commodity exchanges in developing countries. This interest persists despite the numerous failures of exchanges in Africa during recent decades. Following the widely publicized success stories of the Ethiopian commodity exchanges, for instance, some 18 countries visited the ECX between

2009 and 2012 to better understand the ECX and to replicate its experiences in their own countries. It is thus of interest to examine the evidence supporting the various claims made about the development impacts of the ECX — such as increased links between smallholders and markets, improved marketing system, increased coffee exports, generated multiplier effects, increased prices for farmers, and increased farmer share in value chains.[8] In retrospect, empirically establishing these claims would have required a carefully designed impact evaluation and monitoring system, which unfortunately did not take place. In the case of exchanges which evolved naturally through private sector initiatives, it is each investor's responsibility to assess profitability; therefore it is not expected that impact evaluations will emerge. However, most of the agricultural exchanges in Africa are supported by government and donor funding, and the underlying rationale for this support is the hope that exchanges will generate social benefits. It is therefore surprising that these initiatives did not incorporate impact evaluations, making it difficult to credibly demonstrate the developmental benefits of commodity exchanges.

IFPRI has launched a study to examine how the coffee sector in Ethiopia — the main commodity traded in the ECX — has changed following the establishment of the exchange. The study relies on three main sources of data: i) a set of focus group interviews; ii) available IFPRI household surveys since the 1990s; and iii) secondary information from government agencies and the International Coffee Association in Ethiopia. The focus group interview data are used to understand changes in the structure of the coffee markets, including changes in market actors, margins, and payment mechanisms. The household data are used to assess whether coffee farmers are better off following the establishment of the ECX. This is done by comparing prices (in real terms) that farmers received before and after the commodity exchange was established (Table 5). These data are also used to test various claims made in the popular media. A report based on these analyses is under preparation, but the emerging results highlight mixed results. On the one hand, the ECX has been successful in:

1. Establishing grades and standards in coffee, oilseeds, pulses, and other export crops traded on the ECX floor;
2. Setting up Warehouse Receipt System for all commodities traded in the ECX;

[8] A 2012 story in The Guardian was titled, *"How Africa's first commodity exchange revolutionized Ethiopia's economy";* a Forbes magazine's 2013 article was title *Africa's Agriculture Commodity Exchanges Take Root*. :*"….the ECX, whose trading volumes hit $1.4bn in 2012, up from $1bn in 2011, has given farmers access to real time pricing information, improved profits and productivity, reduced market segmentation and boosted export quality, advocates say. The stabilization of domestic supply chains is also supporting agro-processors and exporters, diminishing concerns about once rampant contract default. Ethiopian coffee exports increased to $797 million in 2011/12 from $529 million in 2007/8, when the exchange was established, according to the International Coffee Organization (ICO).*

3. Providing better price information through price tickers in major market locations; and
4. Establishing a t+1 payment system, where payment is made within a day after the transaction takes place. This is an improvement from the old auction systems where delays and defaults on payments were common.

While these are all positive developments, it is unclear whether such results depend on direct government interventions such as legally requiring export crops to be traded through the ECX, restricting farmers to sell only in the designated market places and only to government certified buyers, and requiring suppliers to obtain certification from local governments for transporting coffee. If government intervention is needed to produce positive results, such intervention needs to be weighed against possible distortionary effects in order to determine the social good to be derived from commodity exchanges. This is an important area for future research. We attempt to establish some evidence regarding whether increases in coffee export revenues can be fully attributed to the ECX and whether farmers have benefited from better farm gate prices. Our results, presented in Tables 5 and 6, respectively, suggest that the former suffers from attribution issues and the latter is not backed by the statistical evidence.

Table 5 comes from Ethiopia's statistical office, the Central Statistical Agency (CSA), for farm gate price data from coffee-growing regions, the ECX (previously auction house) for Addis Ababa prices, and the International Coffee Association (ICA) for world prices. We compare these data before (2004-2008) and after (2009-13) the ECX took over coffee exports in order to establish the movement of prices over the period since the exchange was set up. Results show that, relative to earlier years, farm gate prices for Ethiopian coffee indeed increased in all coffee-growing regions after the launching of the ECX. At the national level, farm gate prices increased by 55 percent at the farm gate, 59 percent at the ECX, and about 64 percent at the world market. World prices, however, also increased significantly during the same time. Given the absence of any controls or identification strategy, it is impossible to conclude that these gains were (or were not) due to the concomitant increase in world prices. Conclusions drawn by the media[9] and in popular discourse surrounding the ECX are therefore a problematic basis for support of commodity exchanges in developing countries. To assess the impact on smallholder linkages to markets with commensurate improvements in income, one indicator would be any increases in farm gate price as a percentage of wholesale price (at auction or on the ECX) and as a percentage of world price.

[9] *"…trade figures for 2010/11 showed a record return from Ethiopia's coffee exports of US$879 million, which translates to a 59 per cent surge in revenue on the previous year. At the centre of the export success story is the country's commodity exchange, the ECX, set up in 2008 to replace an auction system that critics said was unreliable and murk…"* http://gcrmag.com/economics/view/an-exchange-for-the-better-coffee-on-the-ethiopia-commodities-exchange-ecx

In Table 6, we analyze the farm gate, Addis Ababa, and New York prices of coffee Abyssinia. The bottom two rows of the table show the difference in the shares of farm gate prices and the p-values of the difference between proportion tests for each of the regions. The most striking result is that the difference in farmers' shares in coffee prices before and after the establishment of the ECX are not statistically significant at any conventional level of significance. The only significant difference is observed in case of Yerga, where farmers' shares declined by 12 percent after the introduction of the exchange. This might be because Yerga is known for specialty coffee and there was a disruption in their direct marketing after the ECX started coffee trading in late 2008 and early 2009. Based on these results, it can be concluded that the ECX's claims about linking smallholders to markets or improving farm gate prices are not supported by this set of data.

5. Exploring the Alternatives to Commodity Exchanges

The theoretical basis for the role of commodity exchanges in improving market efficiency is well established. Having an organized exchange can lead to a Pareto improvement, as the exchange can address various forms of market failures, such as high transactions costs (Williamson, 1981), missing markets, and incomplete information (Stiglitz, 1985), as well as liquidity constraints (Telser and Higinbotham, 1977 and Telser, 1981). Furthermore, unlike spot markets, appropriately specified futures contracts add a time dimension that extends the notion of competitive equilibrium Pareto efficiency by enabling trade in contingent claims in the future (Debreu, 1959). The evidence from developed and emerging economies suggests that this is indeed true. Improved price discovery itself implies that the problems of incomplete information, high transactions costs, and other market failures are being addressed. On the other hand, Warehouse Receipts Systems, an integral part of most commodity exchanges, have contributed to increased liquidity in the markets, which is reflected by the trade volumes in successful exchanges.

BOX 1

Taking Commodity Exchange to Farmers' Doorsteps:
India's NCDEX Spot Exchange (NSPOT) Model

In October 2006, the National Commodities and Derivatives Exchange (NCDEX) launched its subsidiary NCDEX Spot Exchange (NSPOT) with a stated mission of redefining commodity value chain. NCDEX describes it as an electronic market where a farmer or a trader can discover the prices of commodities on a national level and can buy or sell goods immediately to anyone across the country. This is a very different model from the centralized exchanges in the industrialized countries, which is what is adopted by most developing countries following the structural adjustments. NSPOT claims many advantages over spot trading—such as improved price discovery, transparency, healthy competition, hedging, grades and standards, warehousing, etc.—that are similar to the advantages of any commodity exchanges. What are then advantages of having spot electronic exchanges? In our assessment, there are three key differences. First, in a centralized exchange, buyers and sellers in spatially dispersed markets from one location, the exchange. NSPOT members can get both spot and future prices in several spatially dispersed market locations from its local centers. Second, NSPOT makes grading and warehousing available at the primary market (mandi) level. Warehouse Receipts Systems (WRS) contributes towards increasing market liquidity and access to price information at local centers improves price discovery. Finally, NSPOT can theoretically bring financial services, quality control, and dispute resolution to the farmers' doorsteps. The success of this model implies that it is possible for spot exchanges to be profitable while working towards upgrading the primary markets to efficient level—a fundamental condition for a central exchange to eventually work.

Source: Author's summary based on information from www.ncdexspot.com

However, very limited success is observed in developing countries, where agricultural markets are plagued by market failures. Clearly, one explanation is the absence of key viability conditions. In order to have Western-style exchanges, all viability conditions need to be improved. However, for most developing countries, addressing those viability conditions would take time. Therefore, an alternative strategy would be to try out new institutional designs instead of replicating the designs of industrialized countries. Here we

examine one such concept from India and draw implications for many existing marketing systems in developing countries (See Box 1).

What can we learn from NSPOT for other developing countries? No one would doubt that primary commodity markets in rural towns in developing countries need to be upgraded. Farmers and traders will need access to good warehouses, finances, and price information. But the question remains whether the benefits of providing these services would outweigh the costs. If this premise is accepted, there are reasons for other developing countries to undertake experiments like NSPOT or other institutional designs. Given the state of the viability conditions in many developing countries, setting up exchanges needs to be a gradual process; however, the evidence suggests quite the opposite situation: most countries went for full-blown exchanges from the start. Several key advantages of the NSPOT model are that it can be piloted at a smaller scale, the costs and benefits can be documented, and the lessons learned can be incorporated for scaling up or down.

There are also other appealing reasons for trying out alternative institutional designs. In their rudimentary forms, exchanges have existed in most developing countries for centuries. Most countries have terms corresponding to auctions; trading of cash crops (e.g., tea and coffee) on auction floors, where physical goods are traded, is indeed a form of exchange. While they do not directly contribute to price risk management, these auctions floors performs important functions such as lowering search costs and reducing market thinness and consequent price volatility. However, to the best of our knowledge, very little thinking, if any at all, has gone into upgrading these age-old institutions. Could an NSPOT-type model be successful in linking these types of auction floors in different locations of a country? Will such an intervention add value to market development? There is no ready answer to these questions, but it is perhaps worth investing in existing auction floors instead of dismantling them as Ethiopia did to promote its exchanges.

Two other alternatives can also be taken into consideration. If setting up a domestic exchange is not viable, one alternative would be to link up with existing commodity exchanges abroad. This works particularly well for exportable commodities. The main factors behind the success of such an arrangement is that a well-established foreign commodity exchange is likely to have better rules and regulations, higher liquidity, and better integration with world markets. Higher liquidity means lower basis risk and better integration with world market, implying that prices in the two countries will be aligned if the commodity is internationally traded. However, there are also risks associated with using foreign commodity exchanges, primarily due to exchange rates policies. For instance, if the local currency devalues, the value of the product will decline in foreign currency terms, which will ultimately cause traders holding stock for future delivery to lose out. Despite these price and exchange rate risks, the net benefits of using foreign markets can outweigh the costs of setting up exchanges in a thin market.

Box 2

Alternative to Setting Domestic Commodity Exchanges
Linking with Functioning Exchanges Abroad

Guatemala. The Associacion Nacional Del Café (ANACAFE) of Guatemala, established in 1960, launched a hedging program for coffee in 1994. It was a response to well-known problems of the small and medium farmers: lack of access to credit and borrowing at high rates of interests, and indebtedness in perpetuity. The ANACAFE addressed this problem through a series of contractual arrangements between producers, exporters, and the banks that provided farmers with an affordable insurance. The farmer is then able to receive credit from one of several banks participating in the program. To hedge prices, producers usually contact an exporter, with whom they fix a price for future delivery of the crop purchased. Subsequently, exporters sell futures or purchase options in the New York Coffee, Sugar and Cocoa Exchange (CSCE) to hedge their assumed exposure. In the case of options, exporters pay the premium in advance and deduct from the price they pay producers upon delivery.

Source: Based on FAO (2007) and information from www.anacafe.org

Indeed, there are now examples of countries successfully using international futures markets. In Latin America, there have been both private and public-private initiatives for risk management after liberalization. A very good example comes from Guatemala, where a coffee association developed an institutional mechanism to address most of the same problems that smallholders face everywhere without a domestic exchange (Box 2). Another example in Latin America comes from Mexico, where the government developed an alternative through a guaranteed minimum price for cotton growers through a private-public partnership to transfer risks from cotton growers to the international markets. The program is administered by a decentralized agency called the Support Services for Agricultural Marketing Agency (ASERCA). For a fixed fee, the program ensures cotton growers a minimum guaranteed price, fixed using the New York cotton futures exchange. ASERCA offers a guaranteed price (in US dollars) and hedges its own risk by using the fee to purchase a put option on the exchange for future delivery at harvest time.

The Mexican example is similar to that of the Ghana Cocoa Board, which has successfully used international futures markets to manage risks. The country's cocoa marketing board announces minimum farm gate price based on the futures prices. Cocoa board uses its revenue and fees to buy options in international commodity exchanges mainly in London, New York and Paris (Gilbert, 2009, Barrientos and Asenso-Okyere (2008). The inefficiencies of a public sector companies notwithstanding, the experiences of Mexico and Ghana in transferring risks to international markets make a good case not all countries have to have own commodity exchanges.

The other alternative is setting up regional commodity exchanges. Through regionalization, a commodity exchange can address one of the most binding viability conditions — large market size. However, this requires creating a common market among the countries that can foster economic integration, increase market size, and make commodity exchanges more likely to succeed. The benefits of such exchanges are well recognized. For example, the establishment of an African commodity exchange was strongly supported by the African Union, and African trade ministers declared it to be a priority in the Arusha Plan of Action in November 2005, which was subsequently endorsed by the African Heads of States during the sixth African Union Summit in Khartoum in January 2006 (UNCTAD 2007). The Pan African Commodity Derivatives Exchange (PACDEX), jointly initiated by the African Union and UNCTAD, was a reflection of such a commitment. However, it turned out to be more challenging than the leadership thought; while it was expected to be launched in Botswana in 2007, UNCTAD reports that it is still in the making.[10] In the meantime, Rwanda launched an exchange in 2013, hoping to capture the regional market within the East African Community (EAC) countries. How this new exchange will evolve remains to be seen.

6. Summary and Implications

Following the structural adjustment programs of the 1980 and 1990s, the governments and donors have generously supported the establishment of agricultural commodity exchanges. There are many popular claims about the success and benefits of these institutions in improving agricultural markets through better integration of both domestic and international markets. This paper has examined these popular claims. In doing so, it has undertaken four tasks: i) provided an overview of worlds commodity exchanges; ii) examined the viability conditions in both general and Africa specific context; iii) synthesized the evidence on the roles of organized commodity exchanges on market development; and iv) examined the alternatives to setting up domestic commodity exchanges.

6.1. Summary of the Key Findings

In industrialized countries, the role of commodity exchanges in improving markets are well documented. They help improve price discovery, increase market liquidity, and manage price risks. For developing countries, on the other hand, there is very limited quantitative evidence as to whether they are able to perform these desired market development functions. To this end, the following results are worth highlighting:

a) There has been unprecedented growth in commodity exchanges in developing countries, with non-OECD countries accounting for a majority of futures and options trades in the world by 2005

[10] The information is available at: http://www.unctadxi.org/Templates/OrganizationalProfile 2577.aspx

(UNCTAD, 2006). However, this has largely driven by emerging countries like Brazil, India, China, and South Africa.

b) Most of the government-led and donor-funded exchanges in other developing countries either failed or continue to exist with government or donor supports. This is largely due to the fact that these countries, especially in Sub-Saharan Africa, neither studied the viability conditions (justifying the establishment of a commodity exchange) nor set up monitoring and evaluation systems (to document experiences). Given that most of these exchanges are supported by governments and donors, this represents a lack of accountability to the citizens whose tax dollars are being used to support these exchanges.

c) Developmental impacts of commodity exchanges are very poorly understood. While there are many popular claims, we did not come across any peer-reviewed publications with rigorous analytical methods. For example, there are many popular claims about the ECX such linking smallholders to markets, increasing export earning, reducing transactions costs, etc. However, this study finds that while ECX has contributed to improving some aspects of the markets (e.g., t+1 payments, development of grades and standard for selected commodities, and warehouse receipt systems) for exportable commodities, we find no evidence to support the popular claims about linking smallholders to markets, increasing export earnings, and other developmental impacts.

d) Our review of several risk management programs suggests that there are many alternatives to setting up domestic commodity exchanges. Examples of such alternatives are found in Asia, Latin America, as well as Africa. In setting up agricultural commodity exchanges, potentials for those alternatives, to the best of our knowledge, have never been taken into serious consideration

6.2. Implications for Policies and Future Research.

Hundreds of thousands of commodities are traded on any given day around the world, but only a few of them are traded in organized commodity exchanges in a limited set of countries. In most of these cases, the exchanges evolved through private sector initiatives. Given this premise, several implications for policies and research can be drawn from this study:

a) If private sectors are discouraged from investing in commodity exchanges due to policy bottlenecks — such as governments' price policies, trade policies, exchange rate policies, or macroeconomic stability —action should be taken to work on addressing these policy bottlenecks, not investing in exchanges. Our review suggests that this was indeed the case behind the failure of exchanges in Zimbabwe and Zambia

b) If commodity exchanges are supported on the ground of addressing market failures, as was the case in Ethiopia, then the benefits should be carefully weighed against possible distortion due to public interventions, such as requiring all exportable commodities to be traded through the exchange.

c) Governments and donors should carefully assess the key viability conditions before investing in setting up commodity exchanges. There are studies to suggest these viability conditions are not present in developing countries, especially in Sub-Saharan Africa. This implies that government and their development partners should place higher emphasis on the alternative institutions that can addressing many of the same problems and have successful track record in developing countries of Africa, Asia, and Latin America.

d) This study has not come across any systematic methods for assessing policy justifications, viability conditions, as well as impacts of commodity exchange. Developing such methods were not important in the context of the industrialized countries because they evolved through private sector initiatives. That is not the case for developing countries, as the exchanges are being supported by government and donor money. Therefore, there is an obligation to the tax payers to assess the feasibility, track progress, and assess the impacts of these public investments.

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Table 1: Key features of selected commodity exchanges

Exchange	Country	Established	Main commodities	Contract type	Ownership	Status
Africa						
ZIMACE	Zimbabwe	1994	Maize	Spot and Forward contract	Public	Not in operation
ZAMACE	Zambia	1994	Maize, Wheat and Soya beans	Spot and Forward contract	Private	Not in operation
SAFEX	South Africa	1988	White Maize and Wheat	Futures and Spot Contracts	Private	In operation
KACE	Kenya	1997	Agricultural products	Future contract	Private	In operation
ASCE	Nigeria	2001	Cotton, Cassava, Coffee, Ginger, Sesame	Exchange and warehouse Receipts	Public	Not in operation
UCE	Uganda	1997	Coffee, Sesame, Maize, Beans, Soy & Rice	Warehouse Receipts	Private	In operation
ECX	Ethiopia	2008	Coffee, Sesame and Beans	Warehouse receipts, Spot Contracts	Public-private	In operation
MACE	Malawi	2004	45 Agric. Commodities	Forward Contracts, Warehouse Receipts	Private	In operation
Asia						
TGE	Japan	1952	Soybean, Beans, Coffee and Sugar	Futures and Options Exchange	Public-private	In operation
DCE	China	1993	Corn, soybeans, beans and rice	Futures Contracts	Public	In operation
ZCE	China	1990	Cotton, sugar, wheat, soybean, sesame, oil	Future and option exchange	public	In operation
NCDEX	India	2003	Beans and Chick Peas	Futures Contract	Private	In operation
MCX	India	2005	Cereals, Oil and Seeds	Future contract and Spot exchange	Private	In operation
MYX	Malaysia	1973	Crude Palm Oil	Futures and Options and Stocks	Public-private	In operation
AFET	Thailand	1999	Coffee, Rubber, Latex and Tapioca	Future and sport exchange	Public-private	In operation
Europe						In operation
WGT	Poland	1995	Wheat and live hogs	Future and sport exchange	Private	In operation
TurkDEX	Turkey	1995	Cotton and Wheat	Future and option exchange	Public-private	In operation
Euronext	Europe	2000	Agricultural	Stock Exchange	Private	In operation
Americas						
BM&F	Brazil	1985	Coffee, Cattle, corn, cotton, sugar, ethanol,	Futures and Options Contracts,	Public-private	In operation
MATba	Argentina	1909	Corn, soybean, sunflower seeds, wheat	Futures Contract and Options	Private	In operation
CBOT	USA	1858	Grains, Ethanol, Treasuries,	Future and option exchange	Private	In operation
KCBT	USA	1876	Wheat	Future and option exchange	Private	In operation
MGEX	USA	1881	Wheat, cereals and maize	Future and option exchange	Private	In operation

Source: Compiled from UNCTAD various year report (2006-2012). www.unctad.com

Table 2: Viability conditions in successful agricultural commodity exchanges

Name	Brazil (BM&F)	China (DCE)	India (MCX)	Malaysia (BURSA)	South Africa (SAFEX)	USA (CBOT)
Commodity specific conditions						
Large[11] market size	282	2,431	463	258	104	2,276
Homogeneous commodity with Grades and Standards	Yes	Yes	Yes	Yes	Yes	Yes
Regulatory effectiveness						
Government (Licensing, oversight, etc.)	Yes	Yes	N/A	N/A	N/A	Yes
Exchange regulations (operational guidelines)	Yes	Yes	Yes	Yes	Yes	Yes
Third party / independent (certification, linkages)	Yes	N/A	Yes	Yes	Yes	Yes
Contract specific conditions						
Close link between contract and cash markets	Yes	Yes	Yes	Yes	Yes	Yes
Small basis risks	Yes	N/A	N/A	Yes	N/A	Yes
Appropriate contract size						
Other enabling conditions						
Physical infrastructure	Yes	Yes	Yes	Yes	Yes	Yes
Financial infrastructure	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic stability	Yes	Yes	Yes	Yes	Yes	Yes

Source: UNCTAD, 2009; and author assessments based on the literature review

[11] By large is meant trade value exceeding US$ 100 billion in 2013.

Table 3: Features of Agricultural Commodity Exchanges in Africa

Countries* (Exchanges)	Funding Supports	Viability Conditions				
		Trade value (Bill. US$)	Trading system	Regulatory Authority	Exchange rate policy*	Total Ag. Export in 2011 (Bill.
Malawi (MACE)	Government and USAID	0.009 (2009)	Open outcry ring	Govt.	Managed floating	1.43
Nigeria (ASCE)	Government	No trade	None	Govt.	Managed Floating	114.5
Ethiopia (ECX)	Govt., USAID, UNDP, World Bank, and CIDA	1.170 (2012)	Open outcry ring	Govt.	Managed Floating	2.88
Kenya (KACE).	USAID	No trade	None	Govt.	Managed Floating	5.76
Uganda (UCE)	USAID, EU, & the Govt.	No Trade	None	Govt.	Freely floating	2.16
Zambia (ZAMACE)	USAID, WFP, and trade association	0.036 (2009)	None	Govt.	Managed Floating	9.00
Zimbabwe (ZIMACE)	Private	0.500 (2000)	Open outcry ring	Govt.	No separate legal tender	3.51

Source: Data on the funding supports, trade values (reporting years in the parenthesis), trading system, and regulatory authority are from AfDB (2013); exchange rates policy from IMF (2013); and agricultural export value from FAO (2013).

Notes: *Nigeria, Kenya, and Zimbabwe have taken additional steps, which are not included in paper, but available in AfDB (2013)

Table 4: Empirical literature on price behaviors and commodity exchanges.

Country/CE	Issue Addressed	Method	Key findings	Authors	Source
India	Impacts of future market in price discovery	Econometric analysis	Market volume and depth are not significantly influenced by the return and volatility of futures as well as spot markets; Future and spot price markets are not integrated	Easwaran and Ramasundaram, (2008)	http://ageconsearch.umn.edu/bitstream/47883/2/4-Salvadi.pdf
India (MCX)	Analyze market behavior and price discovery for nine agric. Commodity	Granger causality	Price discovery mechanism is quite different for different commodities. Commodity such as soybean, palm-oil and wheat price show mixed pattern of price formation.	Chhajed and Mehta (2013)	http://www.ijsrp.org/research-paper-0313/ijsrp-p15144.pdf
China/DCE	Price discovery in the Chinese soybean trading	Error correction Model (ECM)	Future price respond efficiently to exogenous price shock and cash price move.	Zheng et. Al (2012)	http://journals.sfu.ca/nwchp/index.php/journal/article/viewFile/1/1
S.Africa /SAFEX	Efficiency in South African future markets for wheat and sunflower	Econometric analysis	Daily future price changes for both wheat and sunflower seeds are partially predictable from past price	Phukubje et.al.(2006)	http://ageconsearch.umn.edu/bitstream/31713/1/45020198.pdf
USA/CBT	Price discovery in futures and cash markets	Model of simultaneous price dynamics	Futures markets dominate cash markets Wheat, corn, and orange juice are largely satellites of the futures markets for those commodities	Garbade, K. et.al.(1983)	http://www.jstor.org/stable/1924495
Brazil (BM&F)	Price discovery in a thinly traded market	Error correction Model (ECM)	Higher trading volume is linked to long-run equilibrium relationships between cash and futures prices.	Fabio,M. and Garcia,P. (2004)	http://ageconsearch.umn.edu/bitstream/19019/1/cp04ma02.pdf
India (MCX)	Price discovery and Volatility	Co-integration, VECM models and Causality Test	Although price discovery results are encouraging, the volatility spillovers are weak. They conclude that there is no efficient risk transfer system.	Sehgal, Rajput and Diesting (2013)	http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2149790
USA/CBT,KCB, MGE	check if future markets search more for information than cash market to find an	Error correction Model (ECM)	Existence of one equilibrium price across the three future market in the long run but no integration among prices in cash market.	Yang, J. et.al.(1999)	http://ageconsearch.umn.edu/bitstream/15375/1/31020359.pdf

Source: Author compilation

Table 5: Coffee price before and after ECX (US cents per Lb.)

		Producer prices in selected regions						Auction (2004-08) and ECX (2008-13)						NY
		Sidama	Limu	Jima	Harar	Yerg	Ethiopia	Sidama	Limu	Jima	Harar	Yerg	Ethiopia	
2004-2008	**Mean**	**69**	**69**	**60**	**87**	**76**	**74**	**91**	**86**	**85**	**98**	**89**	**89**	**112**
	SD	20.7	16.7	17.4	17.2	17.8	16.5	17.7	19.2	18.2	18.8	14.9	16.5	0.2
	CV	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Min	27.0	31.0	22.0	54.0	43.0	38.0	65.0	40.0	48.0	63.0	56.0	56.0	73
	Max	1100	106	96	122	111	101	148	121	120	143	119	121	156
2009-2013	**Mean**	**111**	**104**	**106**	**145**	**123**	**136**	**142**	**126**	**126**	**180**	**163**	**152**	**174**
	SD	45.6	39.9	42.1	50.3	40.1	39.2	48.6	39.1	45.3	59.6	37.2	40.7	0.5
	CV	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.3
	Min	51.0	45.0	48.0	74.0	76.0	74.0	78.0	76.0	74.0	99.0	112.0	96.0	112
	Max	196	194	190	244	206	212	238	200	225	287	239	228	274
Mean Difference		42.0	35.0	46.2	57.8	46.5	62.0	51.6	40.3	41.2	81.8	74.5	63.0	61.4
P-Value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Central Statistics Agency (CSA), Ethiopian Coffee Authority (ECA), Ethiopian Commodity Exchange (ECX) and Ethiopian Custom Authority (ECA).

Table 6: Farm gate price of coffee as % of final price (auction / ECX and world prices)

		Farm gate price as % of:											
		Auction price (2004-08) and ECX (2008-13)						New York (Coffee Abyssinia) price					
		Sidamo	Limu	Jimma	Harar	Yerga	National	Sidamo	Limu	Jimma	Harar	Yerga	National
2004-2008	**mean**	**0.76**	**0.70**	**0.80**	**0.88**	**0.86**	**0.82**	**0.61**	**0.53**	**0.61**	**0.78**	**0.68**	**0.65**
	SD	0.16	0.11	0.08	0.07	0.12	0.06	0.12	0.09	0.08	0.10	0.07	0.06
	Cv	0.21	0.16	0.11	0.08	0.14	0.08	0.19	0.18	0.13	0.12	0.11	0.09
	Min	0.38	0.39	0.62	0.73	0.50	0.61	0.34	0.26	0.41	0.61	0.50	0.51
	max	0.99	0.96	0.98	1.01	1.01	0.93	0.79	0.74	0.87	1.05	0.79	0.79
2009-2013	**mean**	**0.78**	**0.84**	**0.81**	**0.82**	**0.74**	**0.89**	**0.64**	**0.60**	**0.59**	**0.86**	**0.70**	**0.78**
	sd	0.17	0.11	0.13	0.15	0.11	0.07	0.18	0.13	0.13	0.29	0.11	0.10
	cv	0.21	0.13	0.16	0.19	0.15	0.08	0.28	0.22	0.21	0.33	0.15	0.12
	min	0.37	0.53	0.46	0.38	0.47	0.69	0.24	0.36	0.29	0.29	0.52	0.57
	max	0.99	0.98	0.99	1.00	0.98	1.00	0.89	0.82	0.84	1.43	0.92	0.94
Difference		0.02	0.14	0.01	-0.06	-0.12*	0.07	0.03	0.07	-0.02	0.08	0.02	0.13
Prop. Test		0.61	0.95	0.59	0.16	0.06	0.85	0.83	0.61	0.20	0.98	0.94	0.94

Source: Central Statistics Agency (CSA), Ethiopian Coffee Authority (ECA), Ethiopian Commodity Exchange (ECX) and International Coffee Organization (ICO)