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From futures markets to the farm-gate
Assessing real price transmission along coffee chains

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Abstract

This article contributes to the debate on commodity price transmission and offers an alternative perspective of price formation, transmission and the producer price experience in low-income countries. By investigating the case study of coffee chains, originating in Tanzania the paper demonstrates how the joint forces of global financialisation and domestic liberalisation in producing countries have acted to reorganize coffee chains into structures in which certain chain actors have become increasingly vulnerable to violent price swings while others have managed to remain relatively cushioned from such movements.

Keywords

Commodity prices, financialisation, global commodity chains, coffee

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1 Introduction: A changing context for analysing price transmission in coffee markets

In recent years both research and media attention has been concerned with the concept of price transmission and price shares in commodity markets. The coffee market has been a particular example of such concern. On the one hand research has focused on the diminishing share of retail prices received by low income country producers with large retailers and middle-men taking more than their fair share of the final price (Milford, 2004; Castle, 2002; Fairtrade Foundation, 2012). For these studies niche and speciality markets offer a solution, allowing producers to garner higher prices and maintain a greater share of the retail price. On the other hand the asymmetry of price transmission (both upstream and downstream) has preoccupied numerous economists and econometricians (McLaren, 2013; Liu et al, 2012; Krivonos, 2006; Cudjoe et al, 2010). The main conclusion in these studies has been that price falls are passed down to producers more readily than price rises. The opposite is the case for the movement from producer to retail markets, with price rises more readily passed on than price falls. Distance to market, lack of competition, and poor market integration are blamed for such asymmetric price transmission. Greater market integration and competition as well as the removal of barriers to trade and price distortions would therefore facilitate better and less asymmetric price transmission, according to these studies.

This paper questions the above analyses, from the perspective of method as well as the conclusions drawn and offers an alternative perspective of price formation, transmission and the producer price experience. It is argued that changes in global and national structures play a crucial role in how prices are formed, transmitted up and down the supply chain and hence evolving institutional contexts must be central to any analysis of the nature and implications of price transmission. Through a detailed case study of Tanzanian coffee chains, we show how diverse producers at the upstream end experience such prices and therefore what the broader implications are for coffee production in the longer term. On this basis we introduce the concept of a price chain that traces the formation of prices along the supply chain.

A number of important global, national and local changes have impacted commodity markets such as coffee. At the global level shifting demand from emerging economies such as India and China has impacted on agricultural prices in diverse ways. Commodity prices have also increasingly been influenced by the activities of financial investors (Mayer, 2012; Newman, 2009a,b; Tang and Xiong, 2010). At the domestic or national level many low-income coffee producing countries have undergone widespread domestic and

[1] Swiss National Foundation funded project: NCCR-Trade Regulation Project. Additional funding for field research was granted by the University of London, Central Research Fund.

international trade liberalization that have impacted the way in which coffee is traded domestically and the way in which prices are formed and transmitted across different segments of the market. This process of liberalisation has been recorded to have exposed winners and losers and fragmented groups of agents or actors, including producers (Bryceson, 1999; Harriss-White, 2000; Oya, 2005).

We present the case study of coffee chains originating in Tanzania to demonstrate how the joint forces of global financialisation and domestic liberalisation in producing countries have acted to reorganize coffee chains into structures in which certain chain actors have become increasingly vulnerable to violent price swings while others have managed to remain relatively cushioned from such movements. This in turn will have longer term implications for the sustainability and structure of coffee production and coffee trading in Tanzania. This study is not an econometric study in price transmission, measuring the cointegration or comovement of international and domestic prices for a specific commodity. Instead, it brings together in depth research of price transmission and price experience in Tanzania and internationally to highlight some of the inadequacies of standard price transmission approaches. By drawing on two interlinked research projects that investigated different ends of the coffee price chain using a variety of methods over 2006 and 2007, this article demonstrates the complexities and changing nature of price transmission in international commodity markets.

In particular, this paper goes beyond previous studies of price transmission along commodity chains by tracing the integrated process of price formation from futures markets to producers and studying the impact this has on diverse actors at the extremities of the coffee chain.. The paper demonstrates the heightened volatility of international coffee prices introduced by the financialisation of coffee markets and how this is experienced by different actors along the chain. We demonstrate how certain exporters are able to manage this volatility better than others and how the Tanzanian coffee auction performs an important price stabilising role within the chain. Finally, we demonstrate how producers' experience of coffee prices is diverse and while cooperative unions have facilitated greater price stability, many of the poorest producers are exposed to real price transmission asymmetries. Such price asymmetries will only be exacerbated if further market integration and domestic price liberalisation continue unabated.

2 Current attempts at assessing the transmission and impact of commodity price changes

Recent studies of price transmission across spatially separate markets both horizontally and vertically have focussed on the statistical relationship between prices in physical markets[2] (Abdulai, 2000; Cudjoe, et al. 2010; Krivonos, 2004,

[2] Vertical price transmission refers to the transmission of price signals along the supply were as horizontal price transmission refers to the transmission of price signals between geographically separated markets at the same level of the supply chain.

2006; Lui et al, 2012; McLaren, 2013; Rapsomanikis et al, 2006). These studies have been based on concepts related to competitive pricing behaviour. The law of comparative advantage dictates that resources will be allocated efficiently in the absence of impediments to free trade. This in turn implies that factor and product prices in spatially separated markets will differ only by transfer costs. Given that the definition of market integration implied by the standard spatial equilibrium model links directly to price outcomes, cointegration analysis has become the most prominent analytical tool employed in empirical studies on market integration.[3]

The increased role of financial markets in shaping commodity prices is now widely accepted in academic and policy circles (see for example UNCTAD, 2011). Despite their common deployment of cointegration analyses studies on price transmission within physical markets and price transmission between futures and spot prices have been conducted separately, with the former applied to issues of market integration[4] and the latter to the efficiency of futures markets. The implicit assumption is that futures markets facilitate efficient price discovery and accurately reflects supply and demand for the underlying commodity. In this way Commodity futures markets are viewed as functioning to complete markets in the Arrow-Debreu sense by enhancing efficient allocation across geographically separate markets (Arrow and Debreu, 1954). In this way, the relationship between futures and physical markets are assumed away as if there is a seamless interface between the two.

For the most part, research on the comovement of international and domestic prices has purported to reveal an improvement in the integration of prices, following the removal of policies that distort the market. Rapsomanikis et al (2006) find evidence of greater integration in markets where government intervention is lower. Krivonos (2004) also finds support for improved transmission of prices from world coffee prices to producers across sub-Saharan Africa and Latin America. Imai et al (2008) show that, in the case of India and China, the transmission of prices from world to domestic markets is incomplete due to government intervention.

Evidence from cointegration analysis applied to the study of efficient price discovery on commodity futures markets has been mixed (Bosco, Sabuhoro and Larue, 1997; Fortenbery and Zapata, 1997; Bowman and Husain, 2004; Fortenbery and Zapata, 2004).

> Researchers have come to varying conclusions regarding the efficiency of commodity futures markets and whether futures prices as unbiased predictors of future spot prices (Bowman and Husain, 2004, p4).

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[3] In addition, cointegration and error correction models allow the researcher to test notions such as completeness, speed, and asymmetry of the relationship between prices

[4] Markets are taken to have become more integrated if the degree of pass-through of price changes from the world level to local markets has increased following the reforms.

In their study, Bowman and Hussain (1994) found that most commodity prices appeared to be cointegrated with at least their 3-month or 6-month futures price series.

Most studies on price transmission have focused on demonstrating the positive aspects of greater integration between financial futures and international and domestic commodity markets. Three major issues with the literature and evidence in the area of price transmission can be noted. Firstly, while most analyses of futures and cash price cointegration have exclusively focused on the relationship between price series, some recent studies have illuminated some of the structural factors underlying these relationships. For example, Newman (2009a) finds that during periods where financial investors dominate futures trading volumes on the New York Coffee Exchange, there is a loosening in the relationship between futures prices and supply and demand conditions for physical coffee. Rather than providing evidence for efficient price discovery on futures markets, a finding that futures and cash prices are cointegrated, with futures prices leading cash prices could be interpreted as evidence for financial investment activity on futures markets driving prices on cash markets.

A second major issue with most standard price cointegration studies relates to the data used to derive these results. Producer price data from low-income countries is notoriously unreliable and will therefore not necessarily represent the true price received by a particular producer at a particular point in time (Baffes, 2005). Research on price comovement and market integration also falls short of addressing the distribution of *income* between different vertical markets and actors. Where research has focused on producer *price* shares out of world prices, most studies conclude that liberalisation has led to higher producer shares out of world prices (Temu et al, 2001, Krivonos, 2004, Baffes, 2005). Evidently, however, considering producer prices themselves does not give us a clear indication of the relative *income* received by producers and other chain actors. Following liberalisation, many producers in low-income countries face higher input costs as well as increased costs associated with transportation of their crop as markets are no longer fixed (Bargawi, 2009).

Thirdly and finally, the objectives of greater price transmission and market integration in the context of commodity dependent LICs can be questioned. From the perspective of producers, greater transmission leads to greater pass through of price volatility and may therefore be second best to a situation where producer incomes are stabilised. Improved comovement of prices in different vertical markets may also result in faster and asymmetric price transmission along the chain. From the retail perspective there is evidence of such asymmetric effects that mean increases in wholesale prices are more quickly passed on to consumers and retail markets than negative downturns (Abdulai, 2006; Morisset, 1998). There is some suggestion that the opposite is the case on the production side, with negative changes passed down more quickly than positive ones (Cudjoe et al, 2010; Krovonos, 2006; Lui et al, 2012; McLaren, 2013).

Results from East African coffee markets indicate that coffee producers in Tanzania and Uganda have not benefited from positive price movements in

the same way as they have been detrimentally impacted by negative changes (Fafchamps, Vargas Hill et al, 2008; Krivonos, 2004; Newman, 2009a). Limited access to market information and exploitation by traders is often cited as the reason for this phenomenon (Fafchamps, Vargas Hill et al. 2008), although deeper analysis of these structural causes is limited.

Evidence from price transmission studies can be summarised as demonstrating mixed and sometimes conflicting results. Markets appear more integrated and therefore price transmission between vertical markets is improved. Structural factors that may explain the increased cointegration between markets tend not to be analysed and concerns over data mean that, at the upstream end of the supply chain, analysis is questionable. Increasing evidence of asymmetric price transmission suggests that other factors are helping to shape the price experience. Most analysts have put this down to a variety of market failures, from a lack of competition to poor market integration and lack of information; all of which could be solved by greater competition in the demand and supply of the commodity (McLaren, 2013; Liu et al, 2012; Krivonos, 2006; Cudjoe et al, 2010). Finally, the distribution of incomes across vertical commodity markets and actors is far from clear from current research, as the determination of prices has become more diverse and factors influencing incomes have changed (Kaplinski and Kimmis, 2006).

By contrast to the mainstream economic literature, commodity chain approaches have placed issues of structure and power at the centre of their analyses (Fold, 2002; Gereffi, 1994; Gibbon and Ponte, 2005; Kaplinsky and Fitter, 2004). The strength of the various chain approaches to the study of contemporary commodity markets lies in their focus on endogenous explanations for changes in the functioning of chains, offering the potential for dealing with the political economy.

> Prices at different nodes of a value chain are not exclusively determined by the volumes of demand and supply. They are also determined by oligopolistic behaviour, the ownership of stocks, and the actions of investment funds in futures markets. (Daviron and Ponte, 2006, p256)

While commodity chain literature has filled many of the gaps of current economic analyses of commodity markets by taking a holistic approach and incorporating structural and policy issues, investigations into commodity prices have not been entirely complete. Where commodity pricing and income shares have been considered, the focus has been on the separation of groups according to certain activities and points in the production and marketing system (Gibbon and Ponte, 2005). Overlaps between markets and agents at each point in the commodity chain are usually not fully explored in the commodity-chain literature, although these will be relevant in understanding the role of particular institutions, such as cooperatives, in performing more than one task within the commodity chain (Bernstein, 1996). Furthermore, each link in the chain tends to be seen as encompassing a homogeneous set of actors (Oya, 2002). The focus of most commodity chain analyses is therefore on power relations and heterogeneity between these groups rather than within them. There has also been a tendency for the various chain approaches to

neglect the relationship between commodity chains and their wider economic context as well as interchain relationships. One way in which this has occurred has been the failure to consider the role of finance and financial markets within commodity chains. Financial markets have shaped the structure and functioning of physical chains and have acted as a bridge and coordinating mechanism across chains. Chain analyses have also neglected to consider the role played by powerful agents (from within as well as outside the chain) in seeking out profits from their participation on commodity derivatives markets (Milberg, 2008; Newman, 2009b).

This paper compliments some of the above research and addresses the shortcomings of current price transmission research by incorporating financial market developments at the international level and investigating post-liberalisation institutional changes within Tanzania and for coffee. By also considering the impact of unstable commodity prices on groups of heterogeneous producers and market actors, this paper adds to the limitations of standard commodity-chain research.

3 Study of price transmission along Tanzanian coffee chains

The following study of price transmission along Tanzanian coffee chains constitutes a synthesis of results from primary research conducted by the authors in 2006 and 2007. Results are drawn from stakeholder interviews, village level surveys and producer interviews conducted during field research in Europe and Tanzania.[5]

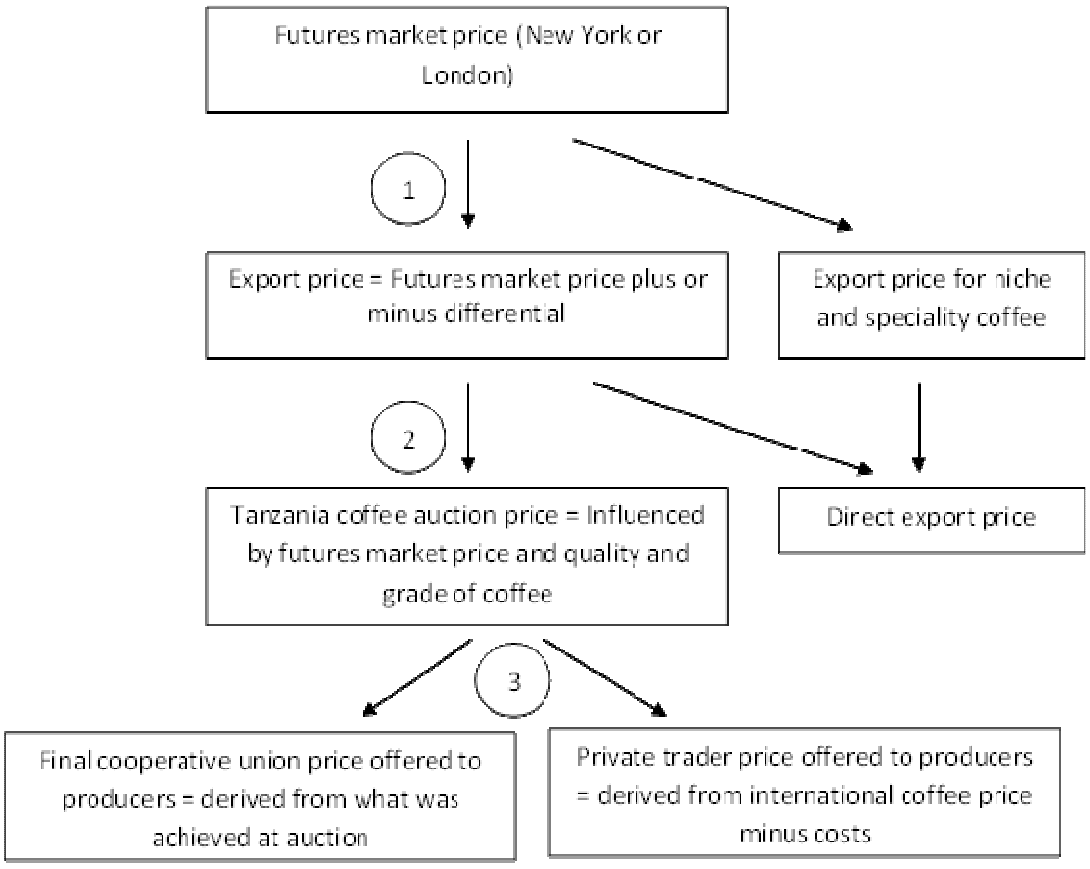
3.1 The stylised coffee price chain

The best place to begin an analysis of price transmission is by looking at a stylised picture of prices along the price chain from international futures market prices down to producer prices in Tanzania. Figure 1 shows how futures prices influence export and in turn auction and finally producer prices downstream. The right-hand side of the chain includes forms of non-standard or speciality price transmission channels. In this paper, the main analysis is focused on the price transmission for bulk Arabica coffee. Figure 1 resembles that of the coffee supply chain (see for example Newman, 2009b) except with the flow in the opposite direction. As will be discussed in greater detail below, rather than determined entirely on the basis of supply and demand realities at each point of exchange as would be predicted by orthodox economic theory, increasingly prices determination at all points in the chain occur in relation to prices arising on international commodity exchanges, the ICE exchange in

[5] The field research was funded by grants awarded by the University of London Central Research Committee and the SOAS Research Committee. For more information regarding field research methods, please consult Bargawi, 2009 and Newman, 2009.

New York for the case of Arabica coffee and the London LIFFE market for Robusta.[6]

Figure 1
The Stylised Coffee Price Chain in Tanzania



The above simplistic, stylised chain is where many price transmission studies begin and end, investigating the extent to which prices in one segment move alongside prices in another segment and whether there is any asymmetry in how prices evolve. Below we break down the above stylised picture to investigate the dynamics of price transmission and the true price experience between the different segments for bulk or standard grade Arabica coffee. We have numbered these points in the chain one, two and three above and will address each of these price transmission relationships in turn.

[6] The formation of price on futures markets and their transmission to local markets do not violate the predictions of orthodox economics as long as futures markets are efficient and efficiently perform their r price discovery role in such a way that accurately reflects supply and demand conditions.

3.2 From futures to cash prices: price transmission from the New York coffee exchange to physical markets

As discussed above, observed comovements and long run equilibrium statistical relationships between futures prices and physical prices for coffee tell us nothing about the actual processes by which prices appearing on the international exchange are translated to the actual prices at which physical coffee is transacted. This section focuses on the trading practices of international traders with headquarters in consuming countries, particularly in Europe and the US. International traders sit between roasters and exporters in the vertical organisation of the international coffee supply system. The coffee industry at the international trader level is highly concentrated, with the top five companies accounting for a market share of over 55%.

As well as the large international coffee trading companies, there exist a number of small coffee trading companies, each accounting for a very small share of world market. The small international coffee trading companies often operate in speciality and niche markets such as fair-trade. While these companies do supply some of the large roasters, the relatively small volumes that they deal in mean that their buyers tend to be small or artisan roasters.

As a matter of course, the largest of the trade houses hedge all green coffee trades. ED&F Man and the Neumann Kaffee Gruppe have their own in-house options and futures brokerages in ED&F Man Commodity Advisors Limited and TRX Futures, respectively. Smaller traders, particularly those dealing in speciality grades of coffee, either do not hedge or will hedge only a proportion of their traded volume. The main reason for this difference in the hedging practices of these two types of firms stems from difference in the process of coffee trading and pricing for the bulk grades compared with the speciality grades. A coffee trader sums up the practice of trading bulk coffee in the following quote:

> That's the first thing you look at, New York and London….And a differential against the market. On a commercial grade it will be a description, let's say Columbia Excelsior, that grade will sell for between level money (which means the same price on New York) to plus 2, plus 2.5. It won't fluctuate far from that band, fob. And so when we're buying we try and buy at level money and when we're selling we try to sell at plus 2 and that's our 2 cent margin, and if we can make 2 cents we're a very happy trade house. On that sort of commercial grade, that's the sort of business it is. And if people aren't selling at level money then we are not buying, pretty much as simple as that.7

Trade in bulk grades are conducted by larger traders. The margins on such trades are small and trading companies derive their incomes from dealing in very large volumes, usually supplying the largest multinational coffee roasting companies. The sourcing of bulk quality coffee from around the world takes place on a continuous basis.

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[7] Quote taken from an interview with coffee trader from an international trading company conducted in 2007

International trading companies purchase coffee from local exporters or companies within their trading group located at origin. For coffee from a particular origin, the international trader decides upon a differential to the international exchange at which he is willing to purchase coffee on that day. This differential reflects difference in quality of the contracted coffee compared with minimum quality deliverable on either of the international exchanges. The trader then contacts his suppliers with this offer price and the negotiation proceeds based upon local market conditions. Coffee is purchased on a price to be fixed basis, at a differential, fob, with the seller's option to fix. It is up to the seller to decide to fix the price at a particular time. The actual price at which the coffee is exchanged will be the futures price at the point of fixing, plus or minus the agreed differential. Since the international trader hedges by offsetting his position in physicals with futures contracts, the time at which the price is fixed is of little importance. On the other hand local exporters tend not to be hedged so the time at which they fix can be of great importance. A seller may hold off fixing the price if he expects the futures price to rise further, he can also lose money if the futures price falls below the price at which he purchased coffee.

The large roasting companies do not purchase commercial grades of coffee on a continuous basis but will be in the market at a particular time for a particular grade. For example, a roaster will enter the market at some point in order to secure the Central American coffees that he needs for the following three to twelve months. The roasting company will make the trading companies aware of their needs, and invite offers from the various traders. Once again the contract price will be based on a differential of the relevant international exchange but with the buyer's option to fix. The price at which physical coffee of commercial grades is bought and sold at the international trade is inextricably linked to the price of coffee futures contracts on the New York and London exchanges.

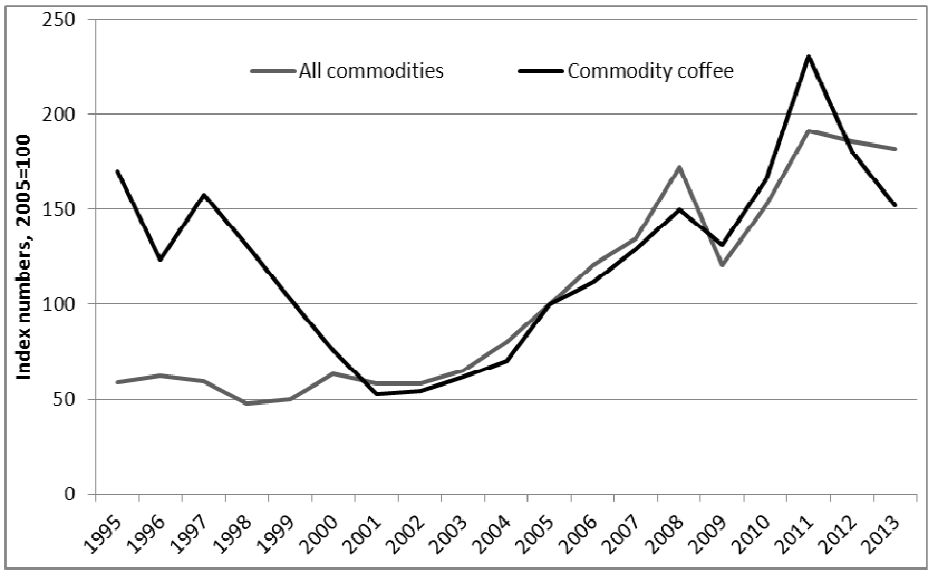
The wholesale use of price to be fixed contracts in the bulk coffee trade at the international trader level cements the relationship between the physical and the futures markets for coffee. The use of these contracts, as opposed to fixed price forward contracts, means that the volatile prices on international exchanges are transmitted more rapidly and fully into the actual prices at which physical coffee is traded. This has implications on the way in which futures prices are transmitted from international exchanges, via international traders, upstream along individual coffee chains towards the production end of the chain. As another coffee trader observed:

> [T]he futures price is the determinant all along the chain. It feeds right down through because at any point on any given day there is not going to be anyone who is able to put a price that is drastically much higher or lower than anyone who is basing themselves on the futures market….This is not so much in the speciality market but in the trading in the bulk commodities, it is very much the futures market.[8]

[8] Quote taken from an interview with a coffee trader from an international trading house conducted in 2007.

The rise of commodities as an asset class in portfolio investment has led to a dislocation between prices appearing on the futures market and supply and demand conditions in physical markets for coffee. The inclusion of coffee futures in a number of hedge and commodity index funds has meant that coffee prices have increasingly reflected changes in financial markets more widely. For example, Newman (2009a) shows that the commodities boom between 2002 and 2007 that was in the first instance driven by increasing demand from India and China for industrial inputs also put upward pressure on coffee prices despite the absence of an associated change in the supply and demand for physical coffee. More recently, Tang and Xiong (2010) has shown that growing index investment in commodities markets since the early 2000s has resulted in increased correlation between futures prices of commodities which are otherwise unrelated in terms of supply and demand dynamics. The onset of the financial crisis with the collapse of the US sub-prime mortgage market in the latter half of 2007 saw an acceleration in the increase of commodity prices despite the anticipation of falling demand in the near future associated with a global economic downturn (figure 2). Price increases accelerated as investors shifted funds from equity markets to commodities until the bubble burst in August 2008 and prices fell rapidly to pre-2007 levels[9].

Figure 2
Monthly commodity price behaviour 1995-2013 (2005 =100)



Source: IMF IFS 2013

[9] Prices recovered after 2009 but have stagnated since 2011 with the slowdown in growth in emerging economies.

From the discussion above we can draw two major conclusions with respect to the transmission of prices from the international exchange to those that appear in the actual transactions between coffee roasters and international traders, and international traders and local exporters in producing countries. Firstly, futures prices that increasingly reflect global economic conditions, global commodity markets, and subsequently the supply and demand for coffee derivatives rather than for physical coffee, exert a major influence on real export prices for bulk coffee from countries such as Tanzania. Second, this is less of a concern for larger trading houses as they are either vertically integrated in the supply chain and/or can use hedging instruments to manage the risk of price instability. For smaller traders and local exporters, however, the influence of futures prices and the instability that this brings has more negative consequences.

3.3 From export prices to the Tanzania coffee auction

The world coffee price is brought to Tanzania by the international coffee trading companies that make up by far the largest share of coffee purchased from origin countries. The way in which international coffee prices are transmitted downstream (from international markets to producers) along the chain depends crucially in the structure of the marketing system in the origin country.

There are two channels by which coffee is exported from Tanzania, via the auction and through direct export. The vast majority of coffee exports go through the coffee auction (over 80%), where exporters purchase graded and bagged green coffee. Here we focus on the auction system as the mediator of price transmission for the majority of coffee exports from Tanzania.[10] For a number of commentators, 'the auction appears to be an efficient pricing mechanism, in the sense that realized prices move in accordance with the New York Board of Trade futures prices' (Baffes, 2005, p.35).

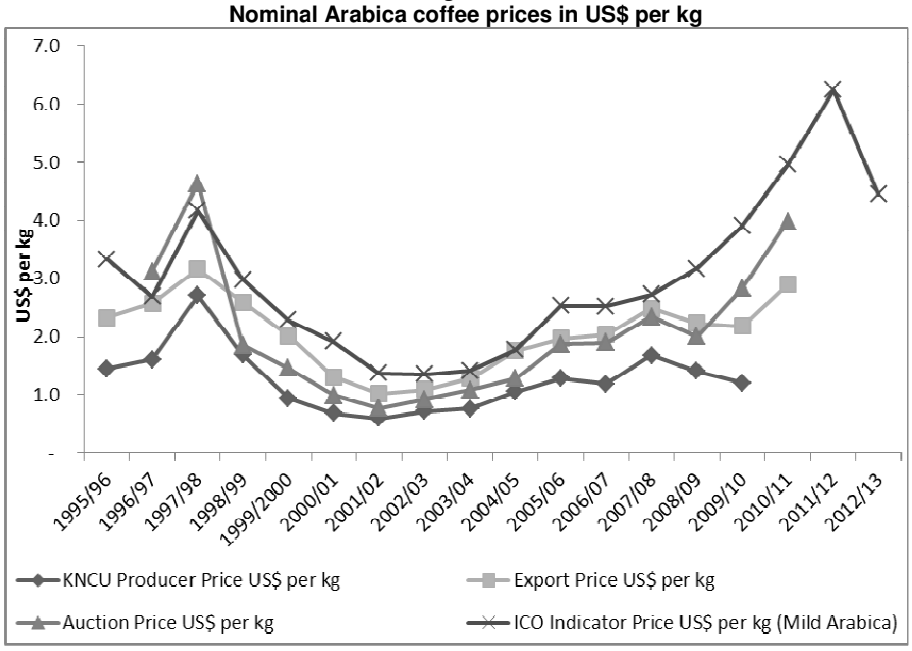
Licensed buyers at the coffee auction include private export companies (dominated by subsidiaries of MNC trading companies) and cooperative unions. For the bulk grades of coffee, the decision for exporters to purchase coffee at the auction will depend upon the sales that have been secured and their need to secure coffee in order fulfil forward contracts. Since these sales will be made at a differential on a price to be fixed contract, the New York and London prices determine the price at which the exporter will purchase bulk grades at the auction. Two of the four MNC exporters interviewed operated as the buying arms of their group. Coffee sales to roasters are made through the

[10] In the 2007/8 season, direct exports accounted for 16.1% of total coffee exports by volume. (Data from Tanzania Coffee Association 2009). Direct export licenses are granted to the owners of coffee, estates or smallholder farmers organised into farmers groups, where coffee samples have been approved by the TCB to qualify as speciality grades. In addition, the seller of the coffee must have a buyer secured who is willing to pay a premium price for the coffee.

European offices and the exporter based in Tanzania is issued with shipping instructions for these sales.

The process of purchasing and exporting speciality grades differs from that for the bulk grades. Firstly, exporters are less likely to sell specialty coffee on contracts which are far forward. Overseas buyers of speciality quality tend to procure coffee on the basis of a sample of the coffee that the exporter has already in stock. Speciality coffee exporters, including the cooperative union exporters, have closer and more direct ties with their market. These exporters will have a good idea of what their customers are looking for and purchase coffee on the auction accordingly. The pricing of speciality coffees differs from the bulk also. They tend to sell on a large positive differential to New York. This differential is realised on the basis of a sample through analysis and cupping by the exporter and his client. Coffee that is destined for the gourmet market may be priced with no consideration for the New York price.

Figure 3
Nominal Arabica coffee prices in US$ per kg



Sources: ICO Indicator Price for Mild Arabica are taken from www.ico.org (1995/96-2012/13); Export and Auction Prices were obtained from the Tanzania Coffee Board; KNCU Producer Prices are taken from the basic KNCU price offered to producers prior to receipt of final payment. Exchange rate: International Financial Statistics, Official rate at end of period – National currency per US$.

In the 2010/11 crop year, 60% of mild Arabica coffee sold at auction was made up of the premium and speciality grades.[11] Since the pricing of these coffees can be less dependent on New York it might be expected that swings in prices on the New York market will not be as fully reflected in the auction

[11] The figure of 60% was calculated based on the categorisation of AA, A and PB grades under premium and speciality coffee.

prices. This would explain the findings by Krivonos (2004) that there was a slight reduction in the degree of price transmission between world and local coffee prices in Tanzania. In contrast to Krivonos' own interpretation of Tanzania, the weakening in the cointegration relationship between world and local coffee prices can be interpreted as the consequence of the TCB's strategy to differentiate green coffee at the auction and market speciality grades where prices are realised differently. In addition to a weak relationship between "world" prices and auction prices, we might expect increases in price on the New York exchange to be more fully reflected in the auction price than decreases. This is suggested by the movement of auction prices in figure 3, with large positive spikes in 1997/98 and again in 2011/12.

The auction system in Tanzania has certain other attributes and performs important functions in terms of price transmission and price stabilisation that are often overlooked. Since 2001 domestic buyers and traders of coffee have been legally separated from international exporters. The blind, electronic auction system facilitates this separation, forcing exporters to wait until the auction convenes (twice every month during the buying season) to purchase Tanzanian coffee at a price based on its grade. In this way the auction system helps to shield those further upstream of the supply chain (cooperatives and private domestic traders) from daily price fluctuations. It helps to reduce the amplitude and frequency of sudden price changes in international futures markets from being transmitted further up the price chain.

Comparisons with Uganda (Newman, 2009b) and with Tanzanian cotton (Bargawi, 2009), both of which lack an auction system and where exporters and producers are in direct contact at the point of sale, suggest that the auction is relatively successful in this regard. In general cooperative and private producer prices are more stable in Tanzania than in Uganda for coffee and more stable than those reported by Tanzanian cotton producers.

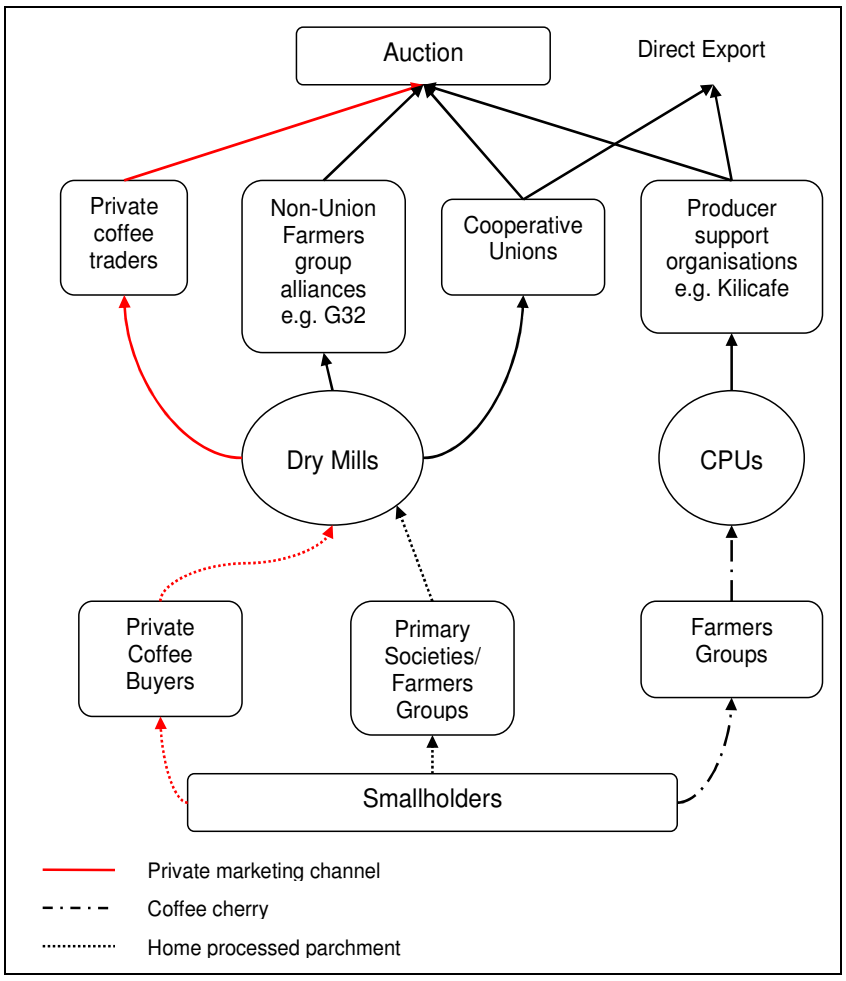
3.4 From the auction to Kilimanjaro coffee producers

While the coffee auction discussed above performs an important role in terms of information provision and price stabilisation, auction prices do not necessarily reflect the prices or coffee income received by producers due to the intervening functions of local cooperative unions, traders and other factors. In terms of domestic price transmission, the Tanzanian coffee marketing system, with its parallel cooperative and private marketing channels, and the existence of a central auction, reveals some interesting complexities (see figure 4).

There are four main channels by which smallholder coffee is marketed locally. Firstly, the purely private marketing channel consists of private coffee buyers (PCBs) purchasing parchment at the farm-gate or at local buying posts. The PCBs deliver the parchment coffee to the dry mills for processing at a fee. The coffee is then stored and ready for auction. While the ownership of the coffee is transferred to the parchment buyer in the private marketing chains, ownership of the coffee remains with the farmers until the auction in the three remaining marketing channels.

Secondly, the traditional cooperative channel is still in operation in the Kilimanjaro region. Farmers deposit coffee at the primary society where it is inspected and weighed. The farmer is given a first payment for the coffee. The collected parchment is transported to the Union owned mill and processed. Once the coffee has been auctioned, the farmers receive a second payment for the difference between the auction price and the first payment, with costs deducted.

Figure 4
Local marketing system for smallholder coffee in Tanzania



The remaining two marketing channels utilise elements of the cooperative marketing system. A number of primary societies have left the unions to which they once belonged and have formed alliances with other farmers groups to market their coffee. Here, cooperation between the groups is for marketing purposes only. The final, and most recently introduced, marketing channel is

that which is coordinated by producer support organisations (PSOs) for direct export which we will not discuss in detail here.[12]

The continued economic viability and functioning of the cooperative unions in most regions has allowed these to provide producers with a more stable producer price. Producers in Kilimanjaro region who sell to KNCU should therefore face more stable prices than those selling to private companies. This is due to the KNCU's stable payment system, which offers producers the opportunity to sell their crop early but still benefit from potential increases in price once the crop has been sold to exporters through the auction. Most coffee producers in Kilimanjaro region have completed harvesting and selling their coffee by December and relative gains from price increases will evidently depend on year to year price developments. Furthermore, prices within the region in which KNCU operates are unified across geographical areas. Producers who chose to sell their coffee to private companies at village buying posts are not able to benefit from this additional payment system and instead receive a one-off price.

In general, therefore, producers selling outside the cooperative system are more exposed to unexpected price shifts than those participating in the cooperative scheme. However, other factors are also important. A consideration of nominal versus real prices is necessary for understanding the transmission of real prices to Tanzanian coffee producers. As figure 3 shows, in nominal terms, producer prices initially increased following liberalisation in the mid-1990s but subsequently gradually declined over time to reach a low in 2001/02. Since then coffee prices have started to rise again in nominal terms.

A consideration of real producer prices reveals an intensification and asymmetry in the way international prices have been passed down to producers. Deflating Arabica coffee prices by the Tanzanian consumer price index and comparing them to domestic food prices in figure 5 demonstrates this process. Producers have been particularly hit by the dramatic real fall in coffee prices over the late 1990s and early 2000s, with prices in 2001/02 representing a quarter of prices in 1997/98. At the same time, the stark increase in the international coffee price since the early 2000s has not been experienced in the same way by producers.

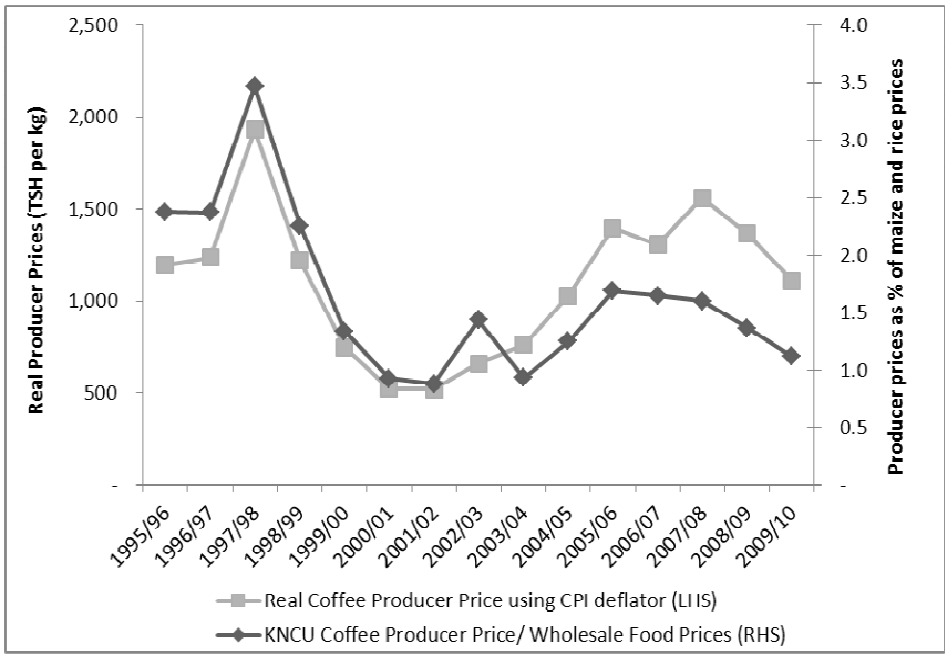
Data shortages prevent us from analysing the progression of nominal producer prices relative to both the cost of informal, seasonal labour and non-labour inputs, such as pesticides. In the context of Tanzanian coffee farming, some of the central input related expenses are chemical pesticides, fungicides and insecticides. Full timeseries datasets of insecticide and pesticide prices are not available and further complications are created by the proliferation of

[12] These are largely funded by external donors and the organisations deliver programmes and services aimed at developing the smallholder coffee sector in Tanzania. The projects aim to improve the quality of smallholder coffee and market it externally as speciality coffee. The main strategy for improving quality is through central processing. Rather than collect home processed parchment, farmers engaged in these marketing channels deliver dry cherry to central pulpery units (CPUs)/washing stations where it is processed. PSOs follow a similar payment system as the Unions.

brand names and types of chemical inputs licensed for use on coffee since liberalisation of the input market.

However, we can determine from our own surveys as well as from secondary data that the real cost of these inputs has increased noticeably since liberalisation, leaving producers with an even lower real price than depicted in figure 5. Comparing the cost of one commonly used chemical (Karate 5 EC) over time, a study of prices in the 1999/2000 season put this at TSH 9375 per litre equivalent in real terms (Itika and Makauki 2007). By 2005/2006, according to Agenda (2006), the cost of this had almost doubled in real terms. More recent data collected by the Regional Agricultural Input Market Information and Transparency System (AMITSA 2013) also shows an increase in the nominal price of a commonly used fertilizer, DAP, between 2010 and 2013. Wholesale prices rose from roughly TSH 1000 per litre in 2010 to over TSH 1800 in 2012. They have since fallen back slightly to TSH 1600 in the first half of 2013.

Figure 5
Real coffee producer prices (1995/96-2009/10)



Sources: The real coffee price is calculated using the producer price (KNCU in TSH/kg 1995/96-2009/10) divided by the national consumer price index (World Development Indicators using 1999/2000 as a deflator. The relative prices are given by the nominal price in TSH/kg divided by the sum of the nominal average wholesale prices of maize and rice (FAO, 2013).

This picture is also reflected is the information gathered during field interviews with producers.[13] The majority of coffee producers reported witnessing a decline in real prices over recent years. A minority of producers across the three villages reported a slight increase in nominal prices in the 2004/05 and/or 20005/06 season. These producers also reported an accompanied increase in the cost of inputs, particularly insecticide and fungicide. As a result, income from coffee for the majority of producers had declined over recent years.

Price instability within the season was predominantly a concern for those marketing their coffee outside the cooperative system. As a result, roughly half of those interviewed were not aware of particular patterns or instability of prices over the season and had made no attempt at managing this or timing the sale of their crop. Producers selling to private buyers were more aware of increased within-season volatility over recent years and the general pattern of rising prices as the season progresses. Table 1 reports prices received by producers in the 2006/07 season across the three villages investigated. Reported producer prices were diverse, depending on which statistics are considered. Furthermore, the prices received by producers varied between and within villages.

Table 1
Nominal average prices per kg of Mild Arabica Coffee in TSH in 2006/07

Village	Auction price: National level	Producer price: KNCU price (including second payment)	Producer price: District level reported price	Average producer price: From interviews	Spread (St. dev) of prices within villages: From interviews
Kiruweni	2750	1500	1500	1800	358
Narumu	2750	1500	1700	1200	105
Wanri	2750	1500	1700	1400	82

Differences in the average prices received by producers for their coffee are quite stark. On average, producers in Kiruweni village obtained a higher price for their coffee in 2006/07 when compared with the other two villages and especially when compared with Narumu village. However, the spread of prices was also greater in Kiruweni village when compared with the other two villages. The above picture regarding prices in 2006/07 is also reflected in the longer term view of prices at the village level, where producers in Kiruweni reported a slightly more positive view of price developments. Wanri and

[13] The analysis and reporting of results in this section rely on data primarily originating from semi-structured producer interviews, as well as village-level focus groups and interviews with agricultural extension staff in the 2006/07 production year. 35 coffee producers of different size and wealth, across three villages (Kiruweni, Wanri and Narumu villages) in Kilimanjaro region were interviewed to obtain information regarding price experiences and impacts.

Narumu village on the other hand displayed a particularly negative view of price developments over recent years.

Taking our analysis beyond that of the village, we can investigate how producers of different wealth experienced prices and price changes.[14] The first thing to note here is that producers in the highest wealth category tended to have a more positive experience of prices when compared to medium and poorer producers. That is not to say that the wealthiest producers across the three villages did not note the drop in prices in 1999-2002 but that the price shock itself and the impact on income was less severe for these producers. A particular distinction that can be made on the basis of producer wealth relates to the impact of within season price changes. Wealthier producer tended to not be faced with this problem, largely because of their involvement and use of cooperative marketing channels and their ability to store their crop and monitor price developments so as to sell their coffee strategically to receive the best possible price. Poorer producers, however, tended out of necessity, to sell their crop in one lump sum, to private traders and were at the mercy of the price offered at the time of sale.

The above considerations suggest that coffee producers in the Kilimanjaro region have been exposed to considerable real price erosion since the mid1990s, although the exact impacts have been diverse. When international and export prices have fallen producers have borne the brunt of the impact in both real and nominal terms. When prices have risen, producers in general have, however, not benefitted proportionally, largely due to the concurrent increases in the cost of inputs and the cost of food. Given the earlier discussion regarding the role of the auction in Tanzania, one can speculate that a counterfactual situation in which no auction system exists would expose Tanzanian coffee producers even further to the above problems.

The results also suggest that producers marketing their coffee via the local cooperative union are better protected from price falls than those selling to private traders. This split between private and cooperative marketing also has a relative wealth dimension, with many of the poorest producers forced to sell to private agents at lower and more unstable prices.

4 Conclusions

This paper has examined the nature of price transmission from futures markets along different segments of coffee chains and their implications for Tanzanian coffee farmers. Four main points can be drawn from our analysis of the processes of price transmission and implications of falling and rising commodity prices. Firstly, it has been argued that there has been a dislocation between movements in coffee futures prices and changes in physical supply

[14] Information on the following producer characteristics was used to form a relative index of wealth within the villages: labour employment and use; land ownership; cattle ownership; make-up and build of the main family home; village political and elite positions held in the past and present.

and demand conditions owing to the rise of commodities as an asset class in portfolio investment. The increasing influence of futures markets in coffee price formation at the international level has meant that general commodity price changes have accentuated world coffee price movements in the shorter term.

Secondly, the way in which prices are transmitted from the world level to coffee producers depends crucially on the structure of the domestic marketing system. The auction system in Tanzania has cushioned the transmission of daily international price movements to domestic traders, including the cooperative unions. By creating an anonymous auction that convenes only twice a month and a legal separation of domestic and export trading, from the perspective of producers, the auction system is superior to one in which exporters and producers negotiate at the farm gate.

Thirdly, at the producer level, the combination of the removal of pan-seasonal, pan-territorial pricing systems; the opening up of the purchasing system for coffee; and the rising cost of inputs, have all resulted in price transmission asymmetries. Positive price movements at the international level have not been proportionally passed on while the transmission of negative commodity price movements to producers is exacerbated.

Finally, the above changes in the domestic marketing, pricing and production structures for coffee have also led to a differentiation in price experience and impact. Within Kilimanjaro region, producers linked to the KNCU cooperative system, who tend to be wealthier producers, are more protected from within season price changes. Poorer producers, selling to private agents, are most exposed to the negative price shifts.

Current discussions on remedying the transmission and impact of unstable commodity prices have tended to focus *either* on the international and financial dimension at the international level *or* have considered aspects relevant to commodity producers. This paper, having considered the transmission of prices from international financial markets down to producers has demonstrated the importance of integrating these areas of research and policy. If the aim of policy is to protect those most vulnerable to the detrimental effects of commodity price instability, then both developments at the international and domestic level need to be taken in to account.

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