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Can Cocoa Farmer Organizations Countervail Buyer Market Power?

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Abstract

Structural adjustment in less developed countries has often mandated removal of state-run marketing boards to enhance efficiency in the marketing chain and to raise farm income. Concerns have been mounting about the negative side effects of cocoa market liberalization, including replacement of the parastatal by imperfectly competitive marketing institutions and the loss of public goods (e.g. research and extension).

It is believed that the link of the supply chain closest to the farmgate may be the least competitive, as farmers in remote areas lack good market information and encounter relatively few buying agents. These concerns, especially related to domestic market competitiveness, have prompted governments, foreign donors and NGOs to promote farmer organizations in an effort to protect farmers (Rabobank, 2000; Baffes, et. al., 2003). The objective of this study is to estimate the degree of market power that exists at the farmgate and determine the efficacy of existing farmer groups to countervail this market power.

In the case of cocoa, widely dispersed farmers create a challenge for those who wish to secure supply for export. If the market post-liberalization were characterized by perfect competition then margins should vary across space by differences in transaction costs that are determined by infrastructure conditions, distance to port or buying center, fuel prices, technology, and other costs that are incurred during transport. If private agents who now interface directly with farmers have the ability to exert monopsony power, then margins will also contain rents that allow part of the efficiency gains to accrue to the private intermediaries, and these may vary according to institutional relationships.

Cameroon provides an opportunity to examine whether cooperatives provide a competitive yardstick that serves to countervail the market power exerted by local buyers and large traders on farmers since after liberalization farmer organizations have remained active to varying degrees across the country. To examine these issues, price transmission models that estimate the effect institutional forces have on the marketing

margins that exist between the internal market (buying center) price and the farmgate price are developed using primary data from a survey performed in 2004. Our price transmission models for various cocoa producing regions in Cameroon attempt to capture intervening policy, institutional factors (e.g. cooperatives as buyers) and transactions costs.

Results show that price transmission and so market integration between the port or buying center and the farmgate dissipates as product passes downstream, with significant regional variation. Institutional arrangements have a significant effect on the prices received by farmers. Infrastructure and market distance variables do not significantly affect market outcomes due to the hub-and-spoke nature of procurement at the farmgate and, in some regions, the captive supply nature of doing business. Market information, once provided by the government, is asymmetric in favor of the buyer, resulting in significantly lower prices being received by farmers. Access to accurate and timely information often comes from membership in a farmer group. In addition, itinerant buyers exert market power against farmers who often do not have another outlet for their product. This power is also rooted in the inability of farmers to measure product quality at the farmgate, previous arrangements for credit and the tendency of itinerant buyers to demand a discount based simply upon the lack of other willing buyers. Institutional innovations of antiquated supply chain links, fostered by farmer organizations, may also reduce transactions costs currently contributing to low farm income.

Marketing cocoa via farmer groups does appear to countervail buyer power but the results are sensitive to the transparency of the internal governance and regional institutional structure. Premiums are found for transactions involving farmer organizations in the center region where coops are most active and successful, and depend on how fees collected by the cooperative are treated. Farmer groups receive additional premiums associated with their capacity to aggregate production and control quality allowing buyers to gain from associated scale economies and limit quality-related risk.

Can Cocoa Farmer Organizations Countervail Buyer Market Power?

Introduction

Historically, the incomes of West African smallholder cocoa farmers were determined by state-controlled entities. These parastatal marketing agencies set marketing margins and intervened in the market for inputs, procurement of cocoa and subsequent export, with differences in implementation by scheme (Hesp and van der Laan, 1985; Kherallah, et. al., 2002). Parastatals precluded the entry of unregulated private intermediaries, ensured the dissemination of market information, set prices and collected implicit and explicit taxes. Mandated farmgate prices aimed to protect the farmers from world price volatility while the taxes levied by the governments on cocoa exports were an important source of foreign exchange and government revenue.

Driven by structural adjustment, market liberalization resulted in the elimination of parastatals and created the need for new private institutions to replace the marketing services of the government agencies (Bloomfield and Lass, 1992; Varangis and Schreiber, 2001).¹ For the major West African cocoa producing countries, the specific impacts of liberalization have been particular to each country, though marketing chain composition (via concentration) has been affected to some degree without exception. Generally, chaotic markets, characterized by the entry of numerous exporters with a wide range of expertise, initially emerged (Gilbert, 1997; Dand, 1999). However, in a few seasons, the majority of these firms were replaced by a few multinational corporations who are now backward integrating into domestic distribution links of the cocoa supply chain.

¹ Nigeria liberalized in 1986. Cameroon followed with successive initiatives in 1991 and 1994. Ghana began liberalizing during the 1992/93 season but has stopped short of dismantling the parastatal, COCOBOD. Liberalized cocoa markets were introduced in Ivory Coast for the 1998/99 season.

Previous research on the exertion of market power in cocoa markets had focused on quotas, as well as implicit and explicit tax schemes, which have been implemented by parastatals (Panagariya and Schiff, 1992). Now, with the advent of liberalization, concerns have arisen regarding the prices of cocoa received by farmers, welfare measures (e.g. farmer income), and the competitiveness of the privatized marketing channels (Gilbert, 1997; McIntire and Varangis, 1999; Oxfam, 2001; 2002; Kherallah, et. al, 2002; Kotecha, et. al., 2002; Gilbert and Varangis, 2003; Dorin, 2003). As the reach of the multinationals extends further into the countryside where the beans are bought from the smallholder farmers, the possibility of market power exertion becomes more plausible.

Wilcox and Abbott (2004) showed using a new empirical industrial organization approach that there is evidence of market power being exerted against farmers by multinational exporters in recently liberalized Ivory Coast. However, due to data limitations, that study could not determine if there was a more fundamental problem where the widely dispersed smallholder farmers are subject to oligopsony power exerted at the farmgate by unscrupulous intermediaries. It is believed that the link of the supply chain closest to the farmgate may be the least competitive, as farmers in remote areas lack good market information and encounter relatively few buying agents.

If the market were characterized by perfect competition then the marketing margins that exist should vary across space by differences in transaction costs that are determined by infrastructure conditions, distance to port or buying center, fuel prices, technology, and other costs that are incurred during transport. However, if private agents who now interface directly with farmers have the ability to exert market power, then these margins will also contain rents that allow any efficiency gains to accrue to the private agent and not the farmer. These concerns, especially related to domestic market competitiveness, have prompted governments and non-governmental organizations alike, to promote farmer organizations in an effort to protect farmers (Rabobank, 2000; Baffes, et. al., 2003).

Farmer cooperatives should offer dispersed smallholder farmers the opportunity to take advantage of a cooperative's bargaining power (for buying inputs and selling output) (Kotecha, et. al., 2002), access to market information and credit (Oxfam, 2001), and provide an organizational structure which may facilitate farmer participation in the reform process brought on by liberalization (Baffes, et. al., 2003). Marketing cooperatives, in particular, are an institutional construct, promoted in both developed and less developed countries that may help relatively numerous farmers overcome the possible market power of more concentrated downstream agents.

Farmers are often in the position where they have very few outlets for their products and would benefit more from acting cooperatively rather than as separate individuals. Farmer cooperatives range from operating solely at the 'grass roots' level where farmers decide to market their produce together, to those that perform the same tasks as private middlemen (*pisteurs*) who purchase cocoa at the farmgate or traders that sell directly to exporters. In some cases, farmer cooperatives are even exporting cocoa but these cases remain relatively rare. In any case, farmer cooperatives must ensure quality and guarantee available quantities, negotiate with agents downstream and transport cocoa to the location of the buyer. If the cooperatives can perform these tasks efficiently, premiums should accrue to members and have positive effects on members. By reducing transaction costs through efficiency gains, countervailing the market power of buyers or competitors or extracting premiums that accrue due to quality differences (in product or service) cooperatives can provide incentives for membership through higher prices, guaranteed payment, subsidized inputs or savings schemes.

Sexton and Iskow's (1993) review of the *competitive yardstick* concept discusses the possible effects of the introduction of a cooperative on the for-profit firms which comprise prevailing markets. The intuition behind the competitive yardstick is that if a cooperative enters, and operates at cost, then farmers will benefit since market power exertion will be signaled by the price differential between cooperatives and for-

profit firms. This signal may force the for-profit firms to behave more competitively as farmers threaten to switch their business to the local cooperatives. Helmlinger (1964, pg. 616) suggests that cooperative marketing acts as a “barometer, measuring the downward pressure of oligopsonistic market conduct on prices received by the primary producers.”

Since liberalization, the success of West Africa cocoa cooperatives has been questioned. In the world’s largest cocoa producer, Ivory Coast, the BNETD (2001) noted that the prices received by farmers selling to cooperatives were consistently greater than those selling to traders or their up-country buyers, *pisteurs*. This promising result argues for facilitating greater participation by the cooperatives in the marketplace but this policy notion may be hamstrung by corruption amongst the cooperative’s leaders (PANA, 2004). Despite the apparent opportunity to receive higher prices, the market share enjoyed by cooperatives has decreased post-liberalization from 32% during the 1998/99 season (BNETD, 2002) to 10% in 2004/05 (t’Sas, 2005), likely leaving close to 90% to be funneled through middlemen. Despite this recent experience, cooperatives may still provide an opportunity to countervail market power. To test this, one must compare the separate market chains originating from the farm: independent farmers dealing with private agents and the others selling cocoa via the cooperatives.

Cameroon provides an opportunity to examine whether cooperatives provide a competitive yardstick that serves to countervail the market power exerted by local buyers and large traders on farmers since farmer organizations have remained active to varying degrees across the country after liberalization. To examine these issues, price transmission models that estimate the effect institutional forces have on the marketing margins that exist between the internal market (buying center) price and the farmgate price are developed using primary data from a survey performed in 2004. Our price transmission models for various cocoa producing regions in Cameroon attempt to capture intervening policy, institutional factors (e.g. cooperatives as buyers) and transactions costs. In a competitive market, the institutional components should

not have any significant effects on the prices received by farmers while the marginal transactions costs should account for differences between the world price and regional farmgate prices.

The first objective of this research then is to estimate the degree of price transmission in the Cameroonian cocoa markets. The price transmission approach in Cameroon allows for premiums and discounts to be quantified. These premium and discounts are paid or charged to farmers based on institutional and transaction cost variables. In addition, the exertion of market power and so capture of rents as mark-ups/downs by intermediaries can be examined using this approach. The second objective is to determine whether cooperatives in Cameroon were able to countervail against market power of domestic intermediaries and so raise prices of their members relative to non-member farmers.

The paper is organized as follows: The next section describes the cocoa market structure and current role of farmer groups in Cameroon. The third section outlines the survey methodology used in Cameroon, followed by a section describing the model framework and data used to test the transmission of downstream prices to the farmgate in Cameroon. Results are presented in the fifth section and concluding remarks are provided in the sixth section.

Cocoa Market Structure in Cameroon

The cocoa market structure found in the major West Africa cocoa producing countries that have chosen to liberalize share some basic similarities. Smallholder farms, whose relatively small output is funneled into a long marketing chain composed of several agents, is one common characteristic. Once the cocoa is sold at the farmgate, it is aggregated as it passes downstream through buying agents until a trader has accumulated an adequate amount of cocoa, which in theory meets some minimum export quality requirement, to be transported to the port for purchase by exporters.

Cocoa production in Cameroon is spread across at least six provinces (in order of production from greatest to least: Southwest, Center, South, Littoral, East and West). The vast majority of production is found in the Center, South and Southwest provinces, which account for approximately 90-95% of total production annually (OsterDowJones Commodity Wire, 2005).

Separated during colonial rule into Anglophone and Francophone states (and united as the Republic of Cameroon in 1973), Cameroon is the only African country with a significant French and English colonial legacy. Currently and historically, Cameroon's cocoa market institutions share similarities with Ivory Coast in the Francophone areas and Ghana and Nigeria in the Anglophone areas.

The domestic cocoa markets are mainly hub-and-spoke systems where cocoa from villages is assembled into larger batches in buying centers before being shipped to the main port of Douala. In Anglophone Cameroon which includes the Center and South provinces, cocoa is purchased by non-licensed buyers (non-LBA or brokers who take ownership of the cocoa) and licensed buyers (LBA's) who work for large traders (merchants) (Figure 1). These agents work in the villages but often have long-standing relationships with farmers as they not only purchase the cocoa but also offer pre-harvest financing to enable sufficient input purchases. Once the cocoa is purchased, the cocoa is stored in larger villages to await the trader's vehicle or it is transported to the buying center where it is sold to the large traders. Traders in the buying centers are typically large enough that all sorting and storage tasks are performed in the buying center before large tractor trailers transport the cocoa to the port for export preparation (*usinage*) and purchase by the multinational exporters.

In contrast, Francophone Cameroon, including the Southwest province, is much like Ivory Coast. Farmers sell their cocoa to *coxeurs* (itinerant *pisteurs* that are independent) or to *caissiers* (*pisteurs* who work for *traitants* (large traders)). Each of these agents perform '*porte à porte*' (door-to-door purchasing of cocoa) but *caissiers*

are more likely to purchase cocoa that has been sold through negotiations between farmer groups and *traitants*. All buyers typically live in the buying center but it is only the *traitants* that do not leave the buying center in search of cocoa. When cocoa is purchased at the farmgate the price has either been fixed through a contract negotiated through a farmer group on behalf of group members or the price is negotiated on the spot and subject to a discount (*refraction*) that may be based on quality or collected as a rent by the buyer. Once cocoa arrives in the buying center, *traitants* purchase, sort, store for short periods and then the cocoa is transported a larger buying center or directly to the port.

Regardless of origin, once the cocoa arrives at the port (Douala), it is purchased by the multinational exporter and prepared for overseas shipment or sold to local processors that service a small confectionary sector in Cameroon.

Cooperatives

In Cameroon, particular interest has been placed on cooperatives by policymakers and non-governmental initiatives, such as the Sustainable Tree Crop Program (STCP) of the International Institute of Tropical Agriculture, as a marketing innovation that can secure larger and possibly higher quality lots of cocoa that may command a premium in the marketplace.

Cooperatives have a long history in Cameroon. Prior to liberalization, cooperatives operated in all seven cocoa producing provinces (Center, East, Littoral, Northwest, South, Southwest and West) with varying degrees of success (van der Laan, 1987). Individual local cooperatives were often unified under the auspices of a union of cooperatives such as the South-West Farmers Cooperative Union (SOWEFCU). Successful cooperatives served as the link in the marketing chain between the farmer and the exporter (the marketing board, ONCPB, in the Anglophone provinces or *exportateurs agréés* which were regulated by the *Caisse de Stabilisation* in the francophone provinces). These cooperatives provided an outlet for farmers to sell their

cocoa, at the price prescribed by the government, and an opportunity to reap further bonuses (*ristourne*) if the cooperative was efficient enough to make a profit. van der Laan (1987) notes that where cooperatives were strong, private traders were not found, and vice versa.

Since liberalization, the cooperative movement has decayed, presumably due to mismanagement, so private licensed buying agents (LBA's), traders and *coxeurs* have overtaken the market.

Buoyed by federal legislation (Law n°92/006 of August 14, 1992), Communal Initiative Groups (or *Groupe d'Initiative Commune* or GIC) were given life as the law provided the legal framework and guidelines for farmer groups to form on a more grassroots level and also required the restructuring of previously existing cooperatives.

Traditional cooperatives in the Southwest have modified their structure in an effort to streamline complex and inefficient institutional hierarchies and conform to the requirements of the recent legislation. Cooperative members were also encountered in the Center province in Nkolondogo but it is uncertain whether this farmer group is actually a GIC, union, federation or coop. Indeed, there is no truly satisfactory distinction between the GIC and cooperative system, except perhaps their hierarchy and marketing practices. The cooperative typically has several salaried employees while the GICs, unions and federations are composed of representatives that receive token compensation for their administrative duties (except for the head of the federation). In theory, marketing cooperatives, such as the members of SOWEFCU, should sell their production directly to the cooperative, who in turn sells that cocoa through an exporter in Douala on behalf of its members. GICs on the other hand, simply census their members to determine how much cocoa is on hand and directly (or indirectly) negotiate a price with buyers in the buying center. The GIC (or union, or federation) signs a contract with the buyer and identifies which members have cocoa for sale. The

buyer then works with the individual GIC members. Otherwise, most of the other services (inputs, savings, etc) offered by the cooperatives and GICs are quite similar.

Currently there are wide varieties of GICs in various stages of operation. Each GIC, if it is to be officially recognized, must satisfy the legal requirements set out in the law. GICs range from unofficial, where several farmers sell some production through informal group sales, to GICs with a hundred or more members organized into successive levels with representative forms of governance. The typical arrangement in the Center and South involves GICs at the farmer-level, unions of GICs that are made up of representative contingents from each member GIC and federations, which are the apex organization made up of representatives from the unions. In some instances, federations are condensed further into Confederations. Each level diminishes in size administratively as representatives are selected from the adjacent level below but expands spatially as villages are aggregated into larger regions. There can be more than one GIC, union and federation represented in one village, but each cocoa farmer interested in joining a group must make a choice and cannot be represented by more than one GIC (and therefore, one union and one federation). In some cases, farmers become members of unions or federations and completely sidestep the typical hierarchy. However, it could be argued that this is basically a GIC that has membership outside of one village.

To provide initial start-up funds and ensure that farmers feel vested in the institution, farmers and organizations are often required to pay one-time or yearly inscription fees. Farmer groups, such as GICs and their associated hierarchy, also require additional operating capital to cover administrative costs. These funds are primarily acquired through transactions fees (prélèvements) paid by farmers and range in total from 10 to 120 FCFA/kg. The fees are also charged to help members save money (often villages do not have formal banking opportunities), retain money for the next season's input requirements and cover the cost of transport if farmer groups are involved in moving output to a centralized location.

In the Southwest, where cooperatives were more prominent relative to the Center and South, farmers have not embraced the idea of forming or joining cooperatives. This is caused by the many failures in the past that soured farmers who lost revenue and received little benefit despite paying dues. The output handled by SOWEFCU has dwindled accordingly. The GIC initiatives have not taken hold in the Southwest either, as those who were dissatisfied by the performance of the cooperatives in the early 1990's do not want to repeat the same mistake.

Survey Methodology

The collection of transaction level data at the farmgate and prevailing prices at the buying center facilitates a rigorous examination of agent interactions and market outcomes at the farmgate.

This study was cognizant of both the intra-country diversity that exists in Cameroon and the paucity of data that otherwise could have aided in the formation of survey weights and inform sample selection. Randomness and industry consensus were used to arrange survey logistics. Given a finite budget and a desire to sample within a study area that comprises the largest proportion of cocoa grown in Cameroon, the administrative zones of the Center, South and Southwest provinces were chosen as the study area.

Generally, buying centers can be categorized as large (cocoa amassed in the buying center is shipped directly to Douala as buyers have relatively high capacity to procure and transport the relatively large quantities of cocoa produced in the area) or small (cocoa often passed on to a second buying center before it is shipped to Douala as farmers are more remote, produce less and the buyers have correspondingly lower capacity). Scale economies, often associated with the procurement and transportation of agricultural products, can lead to differences in average and marginal transaction costs. The size of the buying center may also be associated with the availability of market information and the quality of infrastructure. Lastly, the market environment may differ across buying centers due to barriers to entry that result from the

institutional history of the market. These prospects suggest that size of the buying center could influence the magnitude and variation of farmgate prices. Since the focus of this aspect of the study is to determine how farmer groups affect cocoa market outcomes in Cameroon, both types of buying centers were used to stratify the sample.

Topographic/administrative maps (1:200,000 scale) were used to develop a comprehensive list of possible buying centers located in the three provinces. The buying center lists were pared down by consensus with cocoa researchers at IITA/STCP and their contacts at the *Conseil Inter-professionnel du Cacao et du Café* (CICC) and classified into large and small centers. The final list was considered the best representation of all the major and minor cocoa buying focal points found in the selected provinces based on professional opinion and anecdotal evidence. A stratified random sampling method was then used to randomly select one large and one small buying center to serve as the market level study area within each province.² Bokito and Obala were ultimately chosen in the Center province as the small and large buying centers respectively. In the South, Ngomedzap served as the representative small buying center³ and Sangmelima, the large. Kumba was chosen as the representative large buying center for the Anglophone Southwest province and Tombel the small buying center.

Once buying centers were identified, the topographic/administrative maps were used to develop a comprehensive list of villages within the anticipated buying center market area. The market area was assumed to have a radius of 30-40 kilometers based on infrastructure quality and proximity to other buying

² The random number generator provided with the Microsoft Excel software package was used to ascribe values to each buying center. Buying centers were listed initially in alphabetical order and divided, into large or small, by province. The buying centers were then ranked from lowest to highest and the buying center with the lowest number in each category chosen as one of the market level study sites.

³ Mvengue was originally chosen as the representative small buying center but upon consultation with STCP, Ngomedzap was substituted for Mvengue due to impassible roads that are common in this area during the time of the study (rainy season). As these two buying centers are adjacent, similar culturally and agronomically and villages from portions of the Mvengue *arrondissement* sell cocoa to the Ngomedzap buying center this was considered the best way to preserve the random draw and still work in the area.

centers. When possible, cocoa buyers and local farmer groups were questioned as to which villages supplied which buying center to assist in demarcation of market boundaries and pare down the list.

In some cases, the area under investigation was relatively remote and therefore the number of roads was few. Many villages were clustered along one road and initial attempts at randomized selection of villages resulted in the selection of villages from only one cluster. This spatial distribution of villages and households in Cameroon is largely a vestige of colonial rule, which resulted in most of the rural population living along the main roads to facilitate cash crop production, agricultural development, taxation, and administrative control (Njoh, 2002 and Robiglio, et. al., 2003). Since most variables of interest would be highly correlated across nearby villages, Cartesian quadrants (with the buying center as the focal point) were used to split the buying center market into four regions. Villages were selected under the stipulation that at least one village from each quadrant was randomly drawn to create a sample of four villages. As a sample of six villages was desired (one village per day and a six-day work-week per buying center), the remaining two villages were selected randomly from the master list of villages surrounding the buying center, irrespective of quadrant. The result was six villages being randomly drawn from each of the six buying centers, or thirty-six villages in total.

Once villages were chosen, a visit (*tournée*) schedule was created and letters sent to traditional village leaders to advertise our pending arrival. In most cases, villages were visited before the scheduled surveying date to discuss, face-to-face, the research agenda and logistics with village leaders. This enhanced participation and allayed fears or concerns of ulterior motives.

Upon arrival in each village, at the scheduled time, the team would meet with village leaders and wait for the participants to assemble in each of the previously identified meeting places. Once all participants had arrived, one or several team members would introduce themselves and explain the research agenda in the

appropriate language(s). When the open forum had concluded, village leaders completed a list of the names of audience members and cocoa farmers that were not in attendance. Once the final list had been compiled, every name was assigned a corresponding number and individual interview participants were chosen randomly in the same manner as the buying centers and villages.⁴ Since obtaining marketing information was of paramount importance, the next randomly selected participant on the list served as an alternate and replaced chosen participants who had not sold cocoa during the 2004/05 season. When possible, enumerators visited chosen participants that were not present at the open forum by going to the participant's location (house, field, etc.). An average of 16 surveys were obtained per village.

Interviews were conducted in an individual, one-on-one format unless language issues between the randomly selected participant and randomly assigned enumerator necessitated completing individual surveys in a group setting. The farmer survey instrument consisted of five pages and elicited information about household characteristics, cocoa production and marketing. Each enumerator developed their own style of inquiry but made certain that the survey questions were asked in a consistent manner.

The anticipated number of surveys per village, buying center or province was not weighted by cocoa production, as reliable production numbers by buying center or arrondissement were not available. Instead, all sampling was kept as random and consistent as possible. The number of surveys obtained in each of the provinces ranged from 177 to 198 or 31.7 to 35.4 percent of the total sample.

Buying Center Prices

⁴ Numbers representing each member of the pool of participants were ranked using the random number generator provided with the Microsoft Excel software package. When necessary, enumerators were randomly assigned to interview participants. Eligible participants, those that had sold at least one kilogram of their own cocoa during the 2004/05 season, self-identified themselves after having been chosen.

In addition to transaction level data from the farmgate, enumerators were hired to collect daily prices at the buying centers so farm-level transactions could be associated with those at the buying center, the next step downstream in the marketing chain.

When collecting market data it is prudent to employ enumerators that have intimate knowledge of the industry and working relationships with a variety of local agents. Incentives, such as if the enumerators were also actively collecting prices for their own use as well, also serve to enhance data reliability. For example, the Kumba enumerator was a licensed cocoa buyer and the enumerator in Bokito the head of a federation of farmer groups. The Ngomedzap price was collected by a STCP partner who also serves as the head of a federation of farmer groups. All of the enumerators fit this standard to one degree or another. However, there remain reservations about the collection of buying center prices, given the peculiarities observed in several of the buying centers (e.g. the persistence of extensive plateaus in Sangmelima and Tombel) and the loss of data in Obala. Therefore, Bokito, Ngomedzap and Kumba were chosen as representative ‘competitive’ benchmark prices with which to estimate buying center price transmission regressions in the Center, South and Southwest provinces, respectively. In the case of Bokito and Kumba, these buying centers had the highest prices, similar coefficients of variation with the LIFFE price and were positively correlated with most, if not all, of the remaining buying centers. The Ngomedzap prices did show some similarities with the prices observed in Sangmelima but were slightly higher on average, more variable and were significantly correlated with the Bokito and Kumba prices.

Though the ‘competitive benchmark’ prices were considered the most reliable, measurement error (errors in variables) is still of concern when one considers the sensitivity of the information (leading agents to stretch the truth) and the lack of oversight. To address the errors in variables problem, the monthly average of the predicted values for the representative buying center price (in the month that the corresponding farmgate transaction took place) is used to represent the price received by cocoa buyers (*caissiers* and *coxeurs*)

in the buying center. This is essentially an instrumental variables approach to solving an errors in variables issue where the predicted values of the offending independent variable is used in place of actual values to ensure that there is no longer significant correlation between that variable and the errors. The instruments were the predicted buying center prices.

Buying center price regressions (Equation 1) were estimated using the buying center prices collected every weekday in Bokito, Kumba and Ngomedzap from September 1 to December 31, 2004 and the corresponding LIFFE price (2nd position) from DataStream (2005).

$$P_i = \sum_{j \neq i} \beta_j P_j + \beta_{LIFFE} P_{LIFFE} + \varepsilon \quad (1)$$

where $i \neq j$ and $i, j \in \{Bokito, Kumba, Ngomedzap\}$

Therefore, $Buypred_i$ is the average predicted buying center price (FCFA/kg) in month i in the corresponding province.

Price Transmission Model

The new market-driven price should serve as an indication of the relative scarcity of cocoa on the world market, thus providing information to farmers upon which they can build expectations about consumer's willingness to pay and so make better production decisions. These conditions are not only market-oriented but have new institutional dimensions, as well. If the prevailing market conditions promote entry, then farmers should have more choices when selling their crop. If barriers to entry (scale economies, access to financing, political cronyism) dominate and only a few buyers are able to successfully acquire and trade cocoa, then market power issues may arise. Therefore, it is also these changing market conditions that determine whether liberalization can be considered a success or failure. Market disconnects, measured by

the degree of imperfect price transmission, may be a direct result of market power being held by traders and exporters against buyers and farmers.

The world price is the outcome of the forces of world supply and demand and Cameroon is a very small country in the world cocoa market. The difference between the world price and the domestic price paid to farmers consists of marketing margins that are incurred along the marketing chain. The magnitude of these margins reflects costs related to the cocoa purchased, processing, loading, transportation, taxes, insurance, quality premiums, risk premiums, and trade policy instruments (tariffs). These margins may also contain markups/downs if any of the intermediaries has the ability to exert market power. Over time, the magnitude and fluctuations in the world price also serves as a signal to farmers of current market conditions if that information is transmitted back to the farmgate in the form of farmgate prices.

The efficiency of this transmission has been examined in previous studies in a vertical (farm to retail and trade models) and spatial (market integration - primarily foodstuffs in developing countries using time series data) context (Bolling, 1988; Baffes and Ajwad, 2001; Fackler and Goodwin, 2001; Balcombe and Morrison, 2002; Sharma, 2003; Rapsomanikis, et. al., 2003). Work on cocoa markets found evidence of long-run market integration between the domestic markets of Cameroon, Ghana and Ivory Coast with the world market (Balcombe and Morrison, 2002) while Lloyd, et. al. (1999) found that price transmission in the pre-liberalized domestic market of Ivory Coast was diminished by the farmgate price stabilizing efforts of the *Caisse de Stabilisation*.

In the case of this research, the short-run price transmission of interest is between the buying center price and farmgate prices. The price transmission literature originally gauged government involvement in trade but it can also be related to market power. Balcombe and Morrison (2002), Sharma (2003) and Rapsomankis et. al. (2003) all point out that the value of the price transmission elasticity is affected not only

by the variation in the two prices of interest but also intervening trade/domestic policies, market structure and measurement errors.

To examine these issues, price transmission models that estimate the effect that market and institutional forces have on the marketing margins that exist between the internal market (buying center) price and the farmgate price are developed from the survey in Cameroon. Farmers provided data on transactions from the 2004/05 season. Buying center prices were only available from September 1, 2004 so only transactions from the main crop of 2004/5 are included in the buying center price transmission regressions.

Price transmission is a result of the equilibrium between the buyer (trader)/farmer who demand/supply beans from various cocoa producing regions in Cameroon, which are ultimately sold on the world market as well as intervening policy, institutional factors and transactions costs. Farmers and buyers are both motivated by profit maximization. The resulting regression equation to be estimated is a reduced form from the equilibrium of the agent's, buyer's and farmer's behavior. Buyer (*e*) and farmer (*f*) profit maximization (Equation 2 and 3, respectively) can be expressed in the following manner:

$$\text{Max}_{q_f^i} \Pi_e = P_w Q_e - P_f(Q_f) Q_f - c_e Q_f - I_e Q_f - I^j \sum_i q_f^{ij} \quad (2)$$

$$\text{Max}_{q_f^i} \Pi_f = P_f Q_f - c_f Q_f - I_f Q_f - r \quad (3)$$

where, in equilibrium, the quantity delivered to the buying center, Q_e , equals the aggregate quantity produced, Q_f which can be expressed in terms of individual farmers (*i*) who sell cocoa into the market of buying center (*j*), $\sum_j \sum_i q_f^{ij}$. P_w is the price received by buyers when cocoa is sold in the buying center, P_f is the farmgate price, c_e and c_f are the transaction costs associated with the procurement and

transportation of cocoa by buyers and farmers, I_e, I^j and I_f are premiums and discounts that are attributed to the cocoa depending on buyer, buying center (j) and farmer (village) specific infrastructural, institutional variables (see Table 1), and r represents fixed cocoa production costs. Buyers are considered price takers in the domestic market at the port and P_f is written as inverse demand in the buyer's profit maximization problem to denote that exporters potentially have oligopsony power in the purchase of cocoa beans. Farmers are assumed to be price takers. The conditions for buyer and farmer profit maximization (Equation 4 and 5, respectively) require:

$$\frac{\partial \Pi_e}{\partial q_f^i} = P_w - \left[\frac{\partial P_f}{\partial Q_f} \frac{\partial Q_f}{\partial q_f^i} \right] q_f^i - c_e - I_e - I^j = 0 \quad (4)$$

$$\frac{\partial \Pi_f}{\partial q_f^i} = P_f - c_f - I_f = 0 \quad (5)$$

where, $\left[\frac{\partial P_f}{\partial Q_f} \frac{\partial Q_f}{\partial q_f^i} \right] = 0$ in a competitive market.

The resulting econometric model is implemented using Ordinary Least Squares (OLS) in the following general form (Equation 6) for each province (Center, South and Southwest) separately:

$$\begin{aligned} P_f = & \alpha_0 + \alpha_1(Buycntr) + \beta_1(Vildist) + \beta_2(Graded) + \beta_3(Winfo) + \gamma_1(Coxage) + \\ & \gamma_2(Orgseller) + \gamma_3(Soldatnew) + P_w(LIFFE) + Q(Qinv) + \delta(Totcred) + \\ & \tau_1(Quality) + \tau_2(Qualmat) + \phi_1(Main02) + \phi_2(Mid03) + \phi_3(Main03) + \\ & \phi_4(Mid04) + \varepsilon \end{aligned} \quad (6)$$

As written in Equation 6, the price transmission being explored is that of the buying center price to the farmgate price. If available data covers encompasses more than one season, seasonal dummy variables are included if observations exist for that season and one is dropped to avoid singularity (in this example,

Main04). The intercept contains information about the price received in *Main04*, the second buying center and unobserved ‘average’ transactions costs. The final term, ϵ , represents the unobserved error which is assumed to satisfy standard OLS assumptions.

Table 1 relates the equilibrium that results between the optimization problem of the buyer and the farmer to the adopted price transmission estimation framework and defines variables in Equation 6. Tables 2 – 4 list the descriptive statistics for each of the variables used in each of the three types of regressions that were performed for each province. Each regression used farmgate prices (P_f) that were the post-refraction price received by the farmer after none (*Realprice*), some (*Someprevreal2*) or all (*Allprevreal*) prélèvements collected by farmer groups are subtracted from the farmgate price received.

Downstream prices (P_w) are the average predicted buying center price (*Buypred*) in the Center, South or Southwest depending on where the transaction took place and the month that the transaction occurred.

Just as the price transmission framework allows one to estimate the extent of the relationship between prices, additional information about the influence of market agents, institutions and transactions costs can be examined. Table 1 classifies such variables into categories which facilitates the investigation of agents and institutions at the farmgate (I_f), downstream from the farmgate (I_e), and farmer and buyer-specific transactions costs (c_f and c_e , respectively) in addition to accounting for the effect of buying center and season on market outcomes (These conventions are carried through in the results listed in Tables 5-7).

In essence, the model attempts to capture the marginal cost and institutional components that affect the formation of cocoa farmgate prices in Cameroon. In a competitive market, the institutional components should not have any significant effects on the prices received by farmers while the marginal costs should account for the difference between the downstream price and the farmgate price.

Buying center (j) specific premiums/discounts (I^j) are estimated using a dummy variable, ($Buyctr$) which accounts for the fact that two buying centers were surveyed per province. Buyer-specific institutional variables (I_e) include: *Coxage*, a dummy variable that indicates whether the transaction in the survey involved a *coxeur*; and *Quality*, a dummy variable that indicates that a refraction was taken by the cocoa purchaser.

Farmer-specific institutional variables (I_f) include: *Winfo*, a dummy variable that indicates whether the farmer used media outlets (newspapers, radio, television, or phones) to obtain cocoa market information often or always; *Orgseller*, a dummy variable which indicates whether the transaction involved the farmer selling cocoa through a farmer group, *Totcred*, a dummy variable which indicated whether the farmer had taken credit during the past two seasons (03/04 or 04/05) included in the survey; and *Qualmat*, a dummy variable that indicates whether quality was perceived to be a factor when a refraction was taken.

Proxies for buyer-specific transactions costs (c_e) include *Vildist*, the distance between the village where the cocoa was purchased and the buying center; *Graded*, the proportion of the distance between village and buying center than was on paved, graded gravel or grade dirt roads; *Qinv*, the inverse of the total amount of cocoa sold in the transaction to estimate scale economy effects and the seasonal dummy variables that differentiate between the main and mid crops by season given the characteristics of the seasons (production quantities, quality, etc.).

Farmer-specific transactions cost (c_f) refer to those incurred by farmers who chose to market their cocoa in the buying center themselves rather than at the farmgate (*Soldatnew*).

Each regression was estimated using OLS. Simple monthly averages of the predicted buying center price were calculated for use in the price transmission model. The Breusch-Godfrey (autocorrelation) and unit

root (stationarity of the data and residuals) tests were performed given the time series nature of the buying center price data. Regressions with Kumba and Ngomedzap as dependent variables had autoregressive errors which were accounted for using the AR(1) correction provided by SAS in the Proc Model routine (SAS, 2005). Subsequent tests confirmed that there was no evidence of autocorrelation or non-stationarity post-correction. Diagnostics performed on the regression with Bokito as the dependent variable were inconclusive and no correction for autocorrelation was made. In addition, Breusch-Pagan tests suggested that heteroskedasticity was present. In order to rely on the t -test test statistics, heteroskedasticity-robust standard errors were used to construct t -statistics following Wooldridge (2000). p -values are reported for price transmission results throughout the results section.

Results

The coefficient estimates associated with the buying center price can be loosely interpreted as a price

transmission elasticity $\left(\varepsilon = \frac{\partial P_f}{\partial P_w} \frac{P_w}{P_f} \right)$, which describes the relationship between the farmgate price and the

buying center price. In this case, the actual estimated coefficient is simply the slope, $\frac{\partial P_f}{\partial P_w}$, without

multiplying the estimate by the ratio of farmgate to buying center price (which is close to one).

Theoretically, a price transmission elasticity can take any value between zero (no transmission so prices are somehow insulated from the downstream market) and one (perfect price transmission with zero transactions costs) or greater than one for exports. In the context of this study, if the estimate is different from zero, then there is evidence of price transmission (hence at least partial market integration) between the buying center and farmgate price. In addition, this outcome is also evidence that the two prices in question differ proportionally from one another. Since transaction costs are non-zero (they are estimated in the regression), the expectation is that the price transmission will be slightly less than one. If the market is

indeed insulated from the downstream market, due to intervening market power, significant transactions costs or institutional factors, then the price transmission elasticity will be lower than one and, in the extreme case of isolated markets, will not differ from zero. A somewhat analogous interpretation of the parameter estimates is that of a partial correlation coefficient. If farmgate prices are correlated with the buying center price, they will move in the same (positive) or opposite (negative) direction over time and if the relationship is statistically significant, the two markets are connected. If there is no statistically significant relationship, then the markets are disconnected and prices do not fluctuate in a similar fashion.

The margin between the world price and the farmgate price is the result of transaction costs and agent behavior along a lengthy marketing chain from the farmgate to the EU-15 and United States. In contrast, the margin between the farmgate and the buying center is 'arms-length' and is often composed of transaction costs and the behavior of a single buyer as the buying center is the point at which cocoa from the villages is assembled and prepared for transport to a larger buying center or sent to the port for export. This shortening of the marketing chain should serve to augment the transmission of prices relative to that between the farmgate and world prices. The Center and South conform to this expectation, with price transmission elasticities of 0.87 and 0.86, respectively (Tables 5-7). This result is evidence that there is, as expected, a high degree of price transmission between the farmgate and the buying center in these areas. These two links in the marketing chain of the Southwest appear to be disconnected, with insignificant price transmission found. This is likely related to the minimal variation in observed farmgate prices in the Southwest (standard deviation of 12 FCFA/kg versus 17 FCFA/kg and 22 FCFA/kg in the South and Center, respectively where the average price ranged from 526 FCFA/kg in the South to 671 FCFA/kg and 675 FCFA/kg in the Center and Southwest). The institutional differences in the Southwest may serve to disconnect the farmgate from the remaining marketing chain as the farmgate price reflects more than simply the price of cocoa but also the interest payments paid to buyers and base refraction payments (weighbags).

The Center and South results show that the buyers are passing back to the farmers a price whose variance resembles what they themselves are facing in the buying center. This may be a function of other institutional factors that are captured in this regression – such as the countervailing power of farmer groups against buyers - but the price transmission outcome of 0 or 1 does not automatically translate to imperfect or competitive markets. In addition, the timing of sales may have an effect that goes unnoticed in the regression. Since, there are likely short lags in this process (whereupon buyers profit by not passing back price increases expeditiously), they are not captured in these regressions due to the monthly nature of the data.

While price transmission is relatively high for the Center and South, one purpose of this study is also to estimate the extent of market power in the cocoa markets of Cameroon, which may also be due to “price discrimination” by buyers. To accomplish this, institutional variables associated with the buyer (I_c) and farmer (I_f) are used to determine if these factors significantly influence the market outcomes at the farmgate versus the expected transactions costs associated with farmers (c_f) and buyers (c_c).

Buyer costs such as distance to village (*Vildist*) and the quality of the roads (*Graded*) encountered did not significantly affect farmgate prices except for a slight negative effect of distance traveled on the extremely poor roads of the Southwest. Farmer costs associated with assuming responsibility for the transportation of cocoa to the buying center did have a positive effect (58 FCFA/kg) on prices received in the Center (buyers are apparently willing to pay a premium as they take ownership at their warehouse rather than at the farmgate) but the opposite was found in the Southwest (-25 FCFA/kg), where farmers would be more likely to have broken the bond with their regular buyer and traders would take advantage of the implicit sense of the seller’s urgency.

On the institutional side, farmer groups in Cameroon (primarily composed of the GIC-style farmer groups) can help farmers gather market information (*Winfo*), collectively market cocoa to countervail market power (*Orgseller*) and perhaps facilitate scale economies (*Qinv*), obtain credit (*Totcred*) and promote quality output (*Qualmat*) through collective pressure on farmers and facilitating corresponding premium or discounts based on the buyers decision or action by the farmer group (in the form of fines or refusing to allow the poor quality cocoa to enter the collective sale).

Collective sales by farmer groups was expected to positively affect market outcomes that the farmgate in favor of the farmer. By providing larger amounts of higher quality cocoa (often verified by *caissiers* before the procurement begins and enforced through peer pressure within the group) per transactions, buyers are expected to pay higher prices. They also benefit from scale economies and the risk associated with quality issues is diminished. Theoretically this is the case, but in reality there are confounding factors that may serve to reduce or eliminate the incentives of selling cocoa through local or regional farmer organizations. These include the lack of willing buyers (which forces farmer group to abandon the group sale and provides *coxeurs* information about cocoa availability and signals the farmer's willingness or need to sell) and transparency issues within the farmer groups (where lack of oversight concerning the *prélèvements* can result in farmers losing money that they had originally stood to gain through savings and inputs). This is shown in the three versions of each regression, where *Realprice* includes all of the *prélèvement* in the farmgate price, *Somepevreal2* retains only *prélèvements* collected for savings and chemicals and *Allprevreal* subtracts all of the *prélèvement* from the farmgate price, representing the case where the farmer groups is not functioning properly.

Realprice regression results show that farmers in the Center receive the greatest benefit by selling in farmer groups, receiving 82FCFA/kg more than the average price per kilogram of cocoa sold, if the *prélèvement* was not charged. The benefit to farmers in the South was not different from zero which is probably due to

buyer reluctance to participate in group sales and the fragility of the groups (as evidenced by a high degree of abandonment by group members). This weakness likely impeded the group's success when dealing with buyers and traders. In the Southwest, where cocoa farmer group participation was extremely rare, there was no benefit to being in the farmer group.

Someprevreal2 represents the situation where the prélèvement is charged but the farmer receives the inputs that the prélèvement pays for and has full access to their savings account, managed by the farmer group. Though administrative and handling costs are paid by the farmer and subtracted from the price received, farmers in the Center still receive prices that were greater than the prevailing average price in their province, with premiums of 55 FCFA/kg. This result shows that, if the farmer group is functioning properly and the prélèvement is allocated accordingly, farmers still receive a price that is considerably higher than average. This should be regarded as the most relevant and realistic case if farmer groups are functioning properly.

Allprevreal is the case where the farmer group charges the farmer a prélèvement per kilogram of cocoa sold through the farmer group but these funds are mismanaged and the farmer received none of the promised benefits. Under these assumptions, Center province farmers still receive a 22 FCFA/kg premium over the average price. Since the incentive remains regardless of how the governance of the farmer group affects the distribution of collected fees, membership makes sense. The South is the case in point where the farmer group members may not realize the full benefits of group membership as squandering the collected prélèvement effectively erases any benefit to the farmer.

The fact that selling collectively matters and plays a significant positive role in those areas where farmer groups are the strongest suggests that these groups do indeed have some countervailing effect against

buyers. The premiums to cooperatives found in the Center province range from 13.7% to 3.7%, depending on how *prélèvements* are treated, and are 9.7% in the most realistic case.

These results show that farmer group membership should be encouraged, with the caveat that training opportunities should be put into place that would allow groups to receive the management experience necessary to maximize the returns to farmers. Collection of the *prélèvement* creates incentives for membership to the farmer since they typically do not have any other source of savings, capacity to pre-purchase discounted inputs or the means to facilitate the price information gathering and negotiating power that a properly functioning farmer group should be able to provide with the necessary financial support. When *prélèvements* become a disincentive because the money is squandered or the farmer group is unable to secure farmgate prices that exceed *coxeur* prices, after administrative costs are considered, then farmers will abandon farmer groups and simply sell to the *coxeurs* or buyers that purchased their cocoa in the past.

Market information results show that it can have a positive effect on the prices received by farmers. Those farmers in the Center and Southwest that often or always used the media sources available in Cameroon (at the time of the survey) to acquire price information received higher prices in the 2004/2005 season with premiums of 15 and 17 FCFA/kg being added to the prevailing average market price for the season, respectively. These 3% price increases are presumably due to the fact that the farmer could negotiate from a relatively advantageous position if there is an informed benchmark from which to begin the negotiations. Farmers who are placed in a position where the information asymmetry favors the buyer will be forced to accept that the buyer's starting price is fair relative to the actual prevailing buying center or world price. While these farmers were asked specifically about using media outlets (newspaper, television, radio, and telephone) as their primary source of information to gather world price information, perhaps their propensity to gather objective information also led them to seek out information on downstream prices closer to their own transactions, such as the buying center price. Since the buying center price bears a

greater resemblance to the farmgate price, this outcome serves as preliminary evidence that information on buying center prices leads to higher prices on behalf of the farmer.

It should be emphasized that *Winfo* did not include those farmers that sold in farmer groups. This was to subdue the expected positive influence of farmer groups and try to capture the effect of market information alone. The positive effect shows that information can play a significant role in market outcomes and farmers groups that pool their resources, including those directly related market information gathering will likely enhance their bargaining power when negotiating contracts with traders. This may also have a spillover effect as it was noted in one village that the GIC was advertising the current price it was receiving allowing non-members to receive relatively unbiased information.

Credit is another issue that plays a role in the prices received by farmers, but only in the Southwest, where approximately 3.5% annualized interest is paid on loans taken from local cocoa buyers. Institutional, climatological and agronomic conditions necessitate the use of more inputs (e.g. fungicides) than in the Center and South. Financing the purchase of inputs through local buyers often leaves the farmers tied to the creditor when the cocoa has been dried in the oven and must be sold immediately. Though interest is not explicitly charged to the farmer, the buyers do pay significantly lower prices to farmers who owe them money. Lack of credit markets that are not directly tied to the purchase of cocoa (proceeds may go towards paying off the debt but the actual price negotiation for the cocoa is with a separate transaction) forces farmers to sell cocoa to one buyer and results in lower prices. In the Center and South, credit was often taken through family members, neighbors and local merchants. While these transactions are not directly tied to cocoa sales, farmers may decide to sell quickly to coxeurs to repay the loan.

Survey results show that farmer capacity to obtain credit differs across provinces. Common credit sources in the Center and South, such as family members, neighbors and tontines, if utilized, may put the farmer in

a position where the need to sell cocoa is going to have much more pronounced immediacy. Though this may have an effect on the farmer's negotiating ability, it apparently does not have a strong effect on the prices received by farmers in the Center and South. The coefficients on the *Totcred* dummy variable are insignificant.

The quantity of cocoa sold by farmer groups may also have an effect. It is hypothesized that achieving economies of scale in capital-intensive operations such as transportation and processing is of utmost importance. If this hypothesis is true, it should follow that farmer group members are rewarded for supplying larger amounts of (at least standard quality) cocoa. If scale effects on pricing are present in the cocoa marketing chain in Cameroon, they are measured by Q_{inv} (where $Q_{inv} = 1/q_f^i$). As a cost, Q_{inv} is expected to be negative and significant if scale economies have a direct effect on the farmgate price.

Since Q_{inv} is the inverse of the quantity sold, the estimated cost is the coefficient multiplied by $Q_{inv} (1/q_f^i)$.

The estimated transactions cost diminishes (price increase or discount decrease) as the amount of cocoa increases as seen in Table 8. Small lots of cocoa are heavily discounted, as it requires the buyer to perform many transactions before the storage capacity of his /her mode of transportation is reached. The Southwest discounts small lots of cocoa the heaviest, as this is where the greatest volumes of cocoa are sold. Given the lack of storage capacity (due to the constantly rainy conditions which necessitates the use of ovens to dry and modified trucks to transport), larger scale production and the necessity to pay back money owed to the buyer, small quantities of cocoa are heavily discounted and infrequently sold. In fact, only 7% of all transactions in the survey were less than 30 kg in the Southwest as opposed to 25% in Center and 18% in the South.

The scale economies in the Center province were significant but the discounts roughly seven times less than those in the Southwest. Small-scale *coxeurs* appear to be more prevalent in the Center where 7% of

transactions had buyers actually carry off product by headload or backpack, whereas 1% of cocoa in the Southwest was transported in this manner. Discounts in the South fell between those in the Center and Southwest.

In addition to larger lots, farmer groups attested to the idea that only the best cocoa from members was allocated for collective sales. If this is true then the discounts that are incurred due to low quality could be erased. While quality matters, it is not at all clear that discounts are always taken for quality related reasons. Refractions may simply be another way (not counting covert farmer revenue losses due to improperly tared balances) that buyers deal in an unscrupulous manner with farmers. To try to decompose the influence of field observations of cocoa quality from simple rent extraction from farmers, dummy variables: *Quality* (1 = refraction was taken) and *Qualmat* (1 = refraction taken due to quality concerns) are used. Each estimate is of a discrete discount and the sum of the two constitutes the full discount that is taken during a transaction that involves a refraction. These results should be interpreted in the following manner: if a refraction was taken (*Quality* = 1), then the farmgate price was discounted by the amount estimated for *Quality*. While if quality was raised as the reason for the refraction (*Qualmat* = 1), then the estimated discount for *Qualmat* is in addition to that for the refraction only. If the estimate for *Qualmat* is significantly different from zero, this suggests that quality is playing a significant role in the buyer's decision to charge the refraction. If the quality-specific discount (*Qualmat*) is not significantly different then zero, this suggests that the buyer is collecting a rent. These discounts are the result of the actual refraction, that was subtracted from the farmgate price to calculate *Realprice*, and the implicit refraction that is manifested as an overall lower than average pre-refraction farmgate price. Farmer groups have the ability to counteract both of these instances of refraction given the promotion of high quality and the negotiation of pre-sale term that theoretically lock in a price with a buyer who is willing to pass on premiums to farmer groups as noted in the *Orgseller* results for the Center province. In fact, fifty to fifty five percent of all transactions in the

Center involved refractions being charged by buyers. The prevalence of farmer group mediated transactions likely had some influence as farmers typically save what is believed to be their highest quality beans for group sales. Weighbags and transactions involving *coxeurs* may have had some effect on the number of transactions that included refractions in the Southwest (72%) and South (74-79%), respectively.

Regression results show that quality plays a significant role in the Southwest, where humidity and foreign matter are constant problems, with the quality discount (*Qualmat*) equaling 34 FCFA/kg and the general discount (or rent, *Quality*) 16 FCFA/kg. This means that cocoa that is perceived to be of lesser quality receives an additional 34 FCFA/kg discount over the rent generally taken by buyers. Interestingly though, most transactions in the Southwest involve a general refraction (72%) and quality is only identified 1-3% of the time. This disconnect is likely an artifact of the farmer's perception of the refraction mechanism and their subjective view of what constitutes good quality cocoa (since it is the buyers, not the farmers, that are subject to refractions based on some certifiable factors of quality that are actually measured at the buying center rather than estimated using 'rules of thumb' as done at the farmgate).

In the Center and South, the general margin taken by the buyer is greater than that for quality but together, they account for a total discount of almost 70 FCFA/kg. Cocoa that is perceived to be of lesser quality is discounted an additional 24 FCFA over the rent typically taken by buyers (which varied from 33 FCFA in the Center 47 FCFA in the South).

Refractions obviously have a significant effect on the formation of farmgate prices. Farmer income can be increased if the refraction system can become more transparent and systematic. Certainly, these results point towards the need for further study of the refraction process: how refractions are set and how they relate to quality versus rent seeking.

The influence of farmer groups can have a significant affect on price. The premiums and discounts discussed above are additive so the premiums that accrue to selling farmer groups can be considered in light of additional premiums, or elimination of discounts related to these additional factors which farmer groups can influence. According these results, this likely includes countervailing the market power of buyers when the group is functioning properly. However, clear evidence of market power, outside of these farmer-related institutional variables playing a significant role, must be established by considering the converse: how buyers can negatively influence the price received by farmers, and therefore farmer income, through unscrupulous tactics and market power against isolated or independent farmers (*Coxage and Quality*).

The distinction between *caissier* (licensed buyer) and *coxeur* (non-licensed buyer) in Cameroon is somewhat tenuous. In the Center and South, all buyers that acquire cocoa through ‘*porte à porte*’ are considered by farmers to be *coxeurs*. Those buyers with a known affiliation with a trader in the buying center are deemed *caissiers*. In this study, farmers were asked to make the distinction between the two for each transaction. While imperfect, the regressions results point out that anonymous sales (typical of ‘*porte à porte*’) result in the farmers receiving a lower price than would have been received if the farmer has sold their cocoa through a representative of a trader in the buying center. Farmers in the Center receive approximately 43 FCFA/kg less than the average farmgate price while farmers in the South and Southwest do not receive a price that is significantly below the average.

One should expect the driving force behind this outcome is the fact that the number of intermediaries between *coxeurs* and traders is often larger than *caissier*-mediated transactions, which occur on behalf of the trader who resides in the buying center and interacts directly with the exporters located in Douala. Indeed in regressions that use the world price compared to the farmgate price over an entire season of transactions, rather than buying center price, this is the case for all provinces (Wilcox, 2006). However, the difference between results may be due to the fact that farmers in the Center are more likely to sell cocoa to *coxeurs* at

the beginning of the season when school fees are due. There is no discernable discount in the South for the buying center regressions because 94% of all sales were to *coxeurs* during that period, so the average farmgate price was also the *coxeur* price and this price was on average lower than the other two provinces by more than 100 FCFA/kg or around 25%. There was no difference in Southwest but the farmers have a much more difficult time determining the difference between licensed buyers and non-licensed buyers given the institutional market differences and long standing personal relationships that often exist between buyer and seller.

Conclusions

The price transmission construct adopted here has raised questions about the effects of cocoa market liberalization on cocoa farmers, especially those in Cameroon. One of the intended consequences of liberalization was exposing the domestic market to world market forces by allowing private agents to perform marketing tasks that were once the domain of the government. This would offer farmers the opportunity to market their cocoa as they wished and, in theory, allow them to obtain a larger share of downstream prices as the suspected inefficiencies of the government-run marketing board and price stabilization schemes were eliminated. The evidence from this research suggests that this may have occurred to an extent, but with adverse consequences that should be addressed.

Regional variation in farmgate and buying center prices suggests that there is a lack of spatial domestic market integration at the trader level of the marketing chain. Farmgate prices in the Center and Southwest are significantly higher than in the South. This is likely a function of the South's relatively lower production, comprising approximately ten percent of the national total, and so low number of buyers. Once subsidized via pan-territorial pricing, the South appears to lack the comparative advantages exhibited in the Center and Southwest, despite the historical importance of cocoa. Remoteness, in terms of infrastructure and access to

market information, coupled with the preponderance of dysfunctional farmer groups (where they exist(ed)) also serves to drive prices down as private agents recoup transactions costs and likely take advantage of rent-seeking opportunities.

Regional differences in price transmission between buying centers and the farmgate point towards institutional, and possibly cultural, differences between the Francophone and Anglophone provinces of Cameroon. While buying center prices are transmitted to the farmgate in the Center and South (Francophone), no such relationship can be found in the Southwest despite the arms-length nature of the transactions. The legacy of former market institutions in each area is certainly important. Consistently different marketing strategies which continue to persist, especially by buyers during the procurement of cocoa, across the two areas also leads one to consider intriguing cultural differences that are beyond the scope of this study. One final point regarding the farmgate to buying center transaction is the sluggish movement of prices, which suggests that the behavior of the buyers and traders in the Anglophone Southwest may not be as competitive as the traders, during interviews, would lead one to believe.

Interestingly, there is no conclusive evidence that infrastructure quality or the distance traveled by cocoa buyers significantly affects the prices received by farmers. Route conditions, measured as the percent of higher quality road surface between the farmgate and the buying center, and the distance between these two cocoa marketing portals may not adequately measure of the interaction between infrastructure, spatial market organization and the magnitude of marketing margins. Given the 'hub and spoke' system that is apparently employed, especially by the itinerant buyers, more information is needed to incorporate the path that buyers take when plying the roads in search of cocoa and how route quality and distances factors into price negotiations.

The influence of market information, or the efficacy of the prevailing market information outlets, suggests that the negotiating capacity of farmers is enhanced when the prevailing prices are 'known'. In general, access to objective market information results in approximately a 3% premium at the farmgate in the Center and the Southwest. However, price information does not appear to influence significantly a farmer's ability to negotiate a higher price with buyers in the South. The lesson is that if there is no other buyer expected to drive by the village that day, then knowing the current market conditions will only leave the farmer frustrated in the knowledge that in a more competitive marketplace they likely could have received a higher price.

In contrast to the isolated farmer waiting for a buyer to call for cocoa during a '*porte à porte*' exercise (Center or South) or having the buyer/lender arrive the oven (Southwest), farmer groups often arrange sales with prospective buyers. Given their ability to aggregate lots, acquire market information and sometimes access standard scales, farmer groups in Cameroon have a positive influence on the prices received by farmers who participate as members, even when non-transparent membership fees are considered. However, outcomes vary by region and the results imply that the incentive for joining a farmer group can be adversely affected by transparency (if fees are not distributed in a transparent manner). This holds true in the Center, as the lower premium is the result of the improper allocation (e.g. stealing) of *prélèvements*. In the South, the contrast is starker as all of the incentive is dissipated completely. The lack of premium in the South is evidence that despite collective sales, the imperfect competitiveness of the marketplace might mute some of the benefit due to the lack of willing buyers. Of course, in the Southwest, where extremely few farmers groups were found, the benefits are not measurable.

Farmers lose potential income when they sell cocoa to itinerant buyers (*coxeurs* or non-LBAs), as opposed to traders (*caissiers* or LBAs) due to receiving significantly lower farmgate prices. In fact, this research has

shown that discounts as high as 7% are being accepted by farmers who opt to sell cocoa to itinerant buyers. Whether this is indeed a choice or a necessity, given the lack of alternatives, is beyond the scope of this current research. However, anecdotal evidence, based on farmer's survey responses, indicates that many farmers do not have other choices to market their cocoa. This lack of alternatives is likely driven by farmer's lack of storage capacity, short term monetary needs, lack of access to capital markets and, perhaps most importantly, the current 'wait and see' market construct. The latter forces farmers to make decisions without any information about whether another buyer is going to arrive, price trends or means of pursuing other marketing opportunities by selling cocoa in the buying center. Unfortunately, even for farmers that do have the wherewithal to bring cocoa to the buying center, the evidence is not conclusive whether farmers will actually receive a price that covers the transactions costs associated with displacing the cocoa that they would otherwise sell at the farmgate. Some farmers attribute this to the signal of impatience that a willing seller sends when displacing cocoa from the farmgate. If the farmer is willing to take a chance at the buying center then he/she must have immediate financial obligations, so buyers can offer a lower price.

Conventional wisdom in the cocoa industry assumes that larger lots of cocoa, that meet an acceptable quality standard, will attract premiums given the scale economies that are thought to exist. Certainly, transportation and *usage* are major tasks related to the domestic marketing of cocoa that require high volumes in an effort to take advantage of inherent scale economies. The magnitude of these premiums appears to be most evident in the Southwest where production capacity is higher and storage capacity lower. Finding that economies of scale matter means that farmers will be rewarded for maintaining supply for buyers, traders, and exporters. These can only be achieved if farmers are able to assemble large lots of cocoa, typically under the auspices of a farmer group.

Lastly, an important finding, and novel approach of this research, was the incorporation of the actual discounting that occurs at the farmgate. These discounts, or refractions, represent margins taken by buyers

that may reflect risks associated with quality or are simply a markdown associated with the negotiating position held by the buyer. They represent one way that farmers can work towards increasing their income – by eliminating or reducing refractions. The largest refractions were found in the South (9%) while the smallest occurred in the Southwest (2.5%). This is due to institutional differences between the Anglophone and Francophone areas. Refractions are somewhat standardized in the Southwest (e.g. weighbags) and highly negotiable in the Center and South. Though refractions aren't necessarily based on quality per se, quality does appear to affect significantly the magnitude of the total refraction. In fact, additional discounts are taken by buyers when quality appears to be an issue at the farmgate (based typically on field experience or subjective determination). Quality-based discounts range from 2% in the Southwest province to 9% in the 2004/05 season in the South. These are in addition to the basic refraction discussed above.

Clearly, the practice of refraction needs to be examined further. Farmers may earn additional income as negotiating power becomes more balanced with reforms such as certifiable quality assessment at the farmgate and the elimination of refractions that are rents that accrue to buyers. One way that this is already being achieved is through farmer group sales where refractions are much less common. This is partly due to the prevalent farmer mentality that their 'best' cocoa is saved for the farmer group, but also a function of the negotiating power of the group, which is rooted in their power, though limited, to guarantee volume and quality.

The end result is that the members of farmer cooperatives (GICs) in Cameroon receive significantly higher prices, when they sell cocoa collectively, than independent farmers who are left to manage under the current '*porte à porte*' system. Marketing cocoa via farmer groups does appear to countervail buyer power but the results are sensitive to the transparency of the internal governance and regional institutional structure. Premiums are found for transactions involving farmer organizations in the center region where coops are most active and successful, depending on how fees collected by the cooperative are treated.

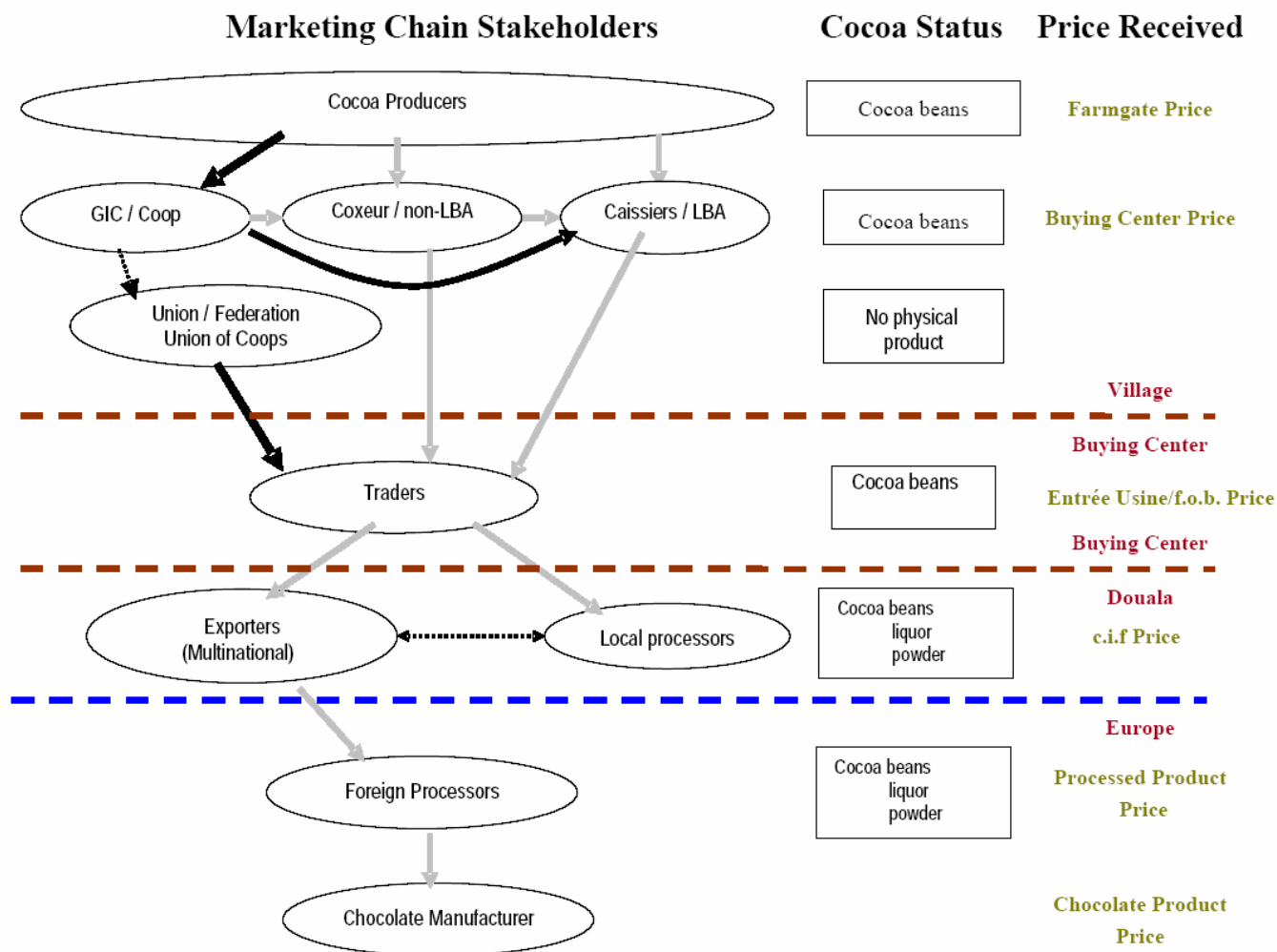
Farmer groups receive additional premiums associated with their capacity to aggregate production and control quality allowing buyers to gain from associated scale economies and limit quality-related risk.

References

- Baffes J. and M. Ajwad. 2001. Identifying price linkages: a review of the literature and an application to the world market of cotton. *Applied Economics*, 33:1927 – 1941.
- Baffes, J., P. Varangis, T. Akiyama, and D. F. Larson, 2003. Commodity Market Reform in Africa: Some Recent Experience. World Bank Working Paper.
[HTTP://ECON.WORLDBANK.ORG/FILES/24874_WPS2995.PDF](http://econ.worldbank.org/files/24874_wps2995.pdf)
- Balcombe, K. and J. Morrison. 2002. Commodity price transmission: a critical review of techniques and an application to selected tropical export commodities. A study for FAO - ESCR.
- Bloomfield, E.M. and R.A. Lass, 1992. "Impact of Structural Adjustment and Adoption of Technology on Competitiveness of Major Cocoa Producing Countries," Technical Paper No. 69, The Development Center, OECD, Paris.
- BNETD, 2001. Dispositif de Suivi- évaluation de la Libéralisation des Filières Café-cacao. Campagne de Commercialisation 2000/2001. Abidjan: Observatoire Café-cacao, Bureau National d'Etude Technique et de Développement.
- BNETD, 2002. Dispositif de Suivi- évaluation de la Libéralisation des Filières Café-cacao. Campagne de Commercialisation 2001/2002. Abidjan: Observatoire Café-cacao, Bureau National d'Etude Technique et de Développement.
- Bolling, C. 1988. "Price and Exchange Rate Transmission Revisited: The Latin American Case," in *Elasticities in International Agricultural Trade*, C.A. Carter and W. H. Gardiner, eds. Boulder: Westview Press, Inc.
- Bredahl, M. I. E., W. H.L. Meyers, and K. I. J. Collins. 1979. "The Elasticity of Foreign Demand for U.S. Agricultural Products: The Importance of the Price Transmission Elasticity," *American Journal of Agricultural Economics*, 61(1) 59-63.
- CICC. 2005. Personal communication.
- Dand, R. 1999. *International Cocoa Trade*. 2nd edition. Woodhead Publishing.
- de Lattre-Gasquet, M., Despréaux, D. and M. Barel. 1998. Prospective de la filière du cacao. (Prospective study of the cocoa commodity channel.) *Plantations, Recherche, Développement*, 5 (6): 423- 434.
- Dorin, B. 2003. "From Ivorian Cocoa Bean to French Dark Chocolate Tablet," CIRAD, AMIS-36. CP-1602.
- Fackler, P.L. and B. K. Goodwin. 2001. Spatial Price Analysis. In B.L. Gardner and G.C. Rausser, eds. *Handbook of Agricultural Economics*. Amsterdam: Elsevier Science.

- FAO. 2005. FAOSTAT. Online. Internet. <HTTP://FAOSTAT.FAO.ORG/> .
- Gilbert, C. L. 1997. "Cocoa Market Liberalization: Its Effects on Quality, Futures Trading and Prices". *The Cocoa Association of London*.
- Gilbert, C. L. and P. Varangis. 2003. "Globalization and International Commodity Trade with Specific Reference to the West African Cocoa Producers." NBER Working Paper No. W9668 (May).
- Helmberger, P. G. 1964. "Cooperative Enterprise as a Structural Dimension of Farm Markets," *Journal of Farm Economics*, 46(3):603-617.
- Hesp, P. and L. van der Laan. 1985. "Marketing boards in Tropical Africa: a Survey." in *Marketing Boards in Tropical Africa*, Arhin, K, P. Hesp and L. van der Laan, eds. KPI Limited, London.
- ICCO. 2005. Online. Internet. <HTTP://WWW.ICCO.ORG/> .
- Kherallah, M., C. Delgado, E. Gabre-Madhin, N. Minot, and M. Johnson, 2002. *Reforming Agricultural Markets in Africa*, Johns Hopkins Press, Baltimore, Maryland.
- Kotecha, S. B. Kerr and Y. Thomas. 2002. "Cocoa Production and Marketing in Africa". Africa Beverages Project Report Number 4, UK Department for International Development (DFID), London.
- Lloyd, T. A., C. W. Morgan, A. J. Rayner and C. Vaillant. 1999. "The Transmission of World Agricultural Prices in Côte d'Ivoire," *The Journal of International Trade and Economic Development*, 8(1):125-141.
- McIntire, J. and P. Varangis, 1999. Reforming Côte d'Ivoire's cocoa marketing and pricing systems, World Bank Policy Research Working Paper 2081 (World Bank, Washington).
- Njoh, A. J. 2002. Development Implications of Colonial Land and Human Settlement Schemes in Cameroon. *Habitat International*, 26:399-415.
- OsterDowJones Commodity Wire. 2005. Online. Internet.
- Oxfam. 2001. "The Cocoa Market – A Background Study," Oxford: Oxfam, Make Trade Fair, <WWW.MAKETRADEFAIR.COM/EN/ASSETS/ENGLISH/COCOASTUDY.PDF> .
- Oxfam. 2002. "Rigged Rules and Double Standards: Trade, Globalisation and the Fight Against Poverty," Oxford: Oxfam, Make Trade Fair. WWW.MAKETRADEFAIR.ORG/ASSETS/ENGLISH/REPORT_ENGLISH.PDF .
- PANA, 2004. "Bogus Cooperatives Swindle Ivorian Cocoa, Coffee Fund." April 29, 2004.
- Panagariya, A. and M. Schiff. 1992. "Taxes versus Quotas: The Case of Cocoa Exports," in Goldin, I. and Winters, A., *Open Economies: Structural Adjustment and Agriculture*, Cambridge University Press.

- Rabobank International, 2000. The dynamics of the cocoa and chocolate industry. Food and Agribusiness Research Publications.
- Rapsomanikis, G., D. Hallam and P. Conforti. 2003. "Market Integration and Price Transmission in Selected Food and Cash Crop Markets of Developing Countries: Review and Applications, in Commodity Market Review, 2003-2004. Commodities and Trade Division, Food and Agriculture Organization of the United Nations, Rome, Italy. <FTP://FTP.FAO.ORG/DOCREP/FAO/006/Y5117E/Y5117E00.PDF>
- Robiglio, V., W. A. Mala and M. C. Diaw. 2003. "Mapping Landscapes: Integrating GIS and Social Science Methods to Model Human-nature Relationships in Southern Cameroon. *Small-scale Forest Economics, Management and Policy*, 2(2):171-184.
- SAS. 2005. Online Manual. <HTTP://WWW-RCD.CC.PURDUE.EDU/SAS/SASHTML/>
- Sexton, R. J. and J. Iskow. 1993. "The Competitive Role of Cooperatives in Market-Oriented Economies: A Policy Analysis." *Agricultural Cooperatives in Transition*, ed. Csaki, C. and Y. Kislev, Westview Press, Boulder, CO. p. 55-83.
- Sharma, R., 2003. The transmission of world price signals: the concept, issues and some evidence from Asian markets. FAO, Commodities and Trade Division, Rome
- t'Sas, V. 2005. "Barry Callebaut Allies 60 Ivory Coast Cocoa Coops -Report," Dow Jones Emerging Markets Report, Factiva, Online, Internet.
- van der Laan, H. L. 1987. Cameroon's Main Marketing Board: History and Scope of the ONCPB. African Studies Centre, Leiden, the Netherlands, Working Papers No. 10. <HTTP://WWW.DARENET.NL/NL/PAGE/REPOSITORY.ITEM/SHOW?IDENTIFIER=HDL:1887/434&REPOSITORY=LEI>
- Varangis, P., and G. Schreiber, 2001. "Cocoa market reforms in west Africa" in Akiyama, A., J Baffes, D. Larson and P. Varangis eds., *Commodity Market Reforms: Lessons of Two Decades*, World Bank, Washington, D. C. pp: 35-82.
- Wilcox, M. D. and P. C. Abbott. 2004. "Market Power and Structural Adjustment: The Case of West African Cocoa Market Liberalization." Selected paper presented at 2004 AAEA Annual Meeting. HTTP://AGECON.LIB.UMN.EDU/CGI-BIN/PDF_VIEW.PL?PAPERID=14201&FTYPE=.PDF
- Wilcox, M.D.. 2006. *Farmgate Prices and Market Power in Liberalized West African Cocoa Markets*. Unpublished PhD Dissertation. Purdue University.
- Wooldridge, J. M. 2000. *Introductory Econometrics*. Cincinnati, OH: South-Western College Publishing



Adapted from Sanogo, 2002

Figure 1: Basic Cocoa Marketing Chain in Cameroon

Table 1: Price Transmission Regression Variables

Category	Variable(s)	Coefficient	Units	Description
Farmgate Prices	P_f	P_f	FCFA/kg	Price received by farmer adjusted for refraction; less prélèvement for administration (<i>Someprevreal2</i>) or less total prélèvement (<i>Allprevreal</i>) if sold by farmer group
Buying Center	I^j	α_1		1 = Obala (Center), Ngomedzap (South) or Tombel (Southwest); 0 = Bokito (Center), Sangmelima (South) or Kumba (Southwest)
Infrastructure	C_e	β_1	kilometers	One-way distance from buying center to village mid-point
	C_e	β_2	%	Percent of distance between buying center and village that is paved, graded gravel or graded dirt in decimal form
Market Information	I_f	β_3		1 = Non-farmer group mediated transactions where the farmer identified newspaper, radio, television or phone as a source(s) of market information that they use often or always; 0 = farmer group mediated transaction or primary source of market information was <i>coxeurs</i> , <i>caissiers</i> , farmer groups or government
Agents	I_e	γ_1		1 = Transaction involved <i>coxeur</i> ; 0 = Transaction involved <i>caissier</i> or farmer group
	I_f	γ_2		1 = Transaction involved farmer group selling cocoa on behalf of the farmer; 0 = farmer sold cocoa independently
	C_f	γ_3		1 = Transaction took place at buying center after farmer performed transport; 0 = transaction took place at the farmgate
Downstream Price	P_w	P_w	FCFA/kg	Monthly average predicted price for cocoa in Bokito (Center), Kumba (Southwest) and Ngomedzap (South) buying centers in the month of the transaction
Scale	C_e	Q	kg^{-1}	Inverse of total amount of cocoa sold in transaction inclusive of refraction
Credit	I_f	δ		1 = Farmer accessed source of credit in either of the past two seasons; 0 = Farmer did not access credit during either of the two seasons
Quality	I_e	τ_1		1 = Buyer discounted cocoa using a refraction; 0 = no refraction
	I_f	τ_2		1 = Buyer or farmer gave reason for the refraction; 0 = refraction taken without reason or no refraction taken

Table 2: Descriptive Statistics for Center Province Buying Center Price Transmission Regressions

Category	Variable	Mean (Median)	Std Dev	Minimum	Maximum
Farmgate Prices	Realprice	597.90	87.87	250	750
	Someprevreal2	573.67	81.58	250	720
	Allprevreal	550.96	76.39	250	710
Buying Center	Buycntr (Obala)	0.40	0.49	0	1
Infrastructure and	Vildist	13.95	4.72	0	22.98
	Graded	0.72	0.40	0	1
Market Information	Winfo	0.29	0.45	0	1
Agents / Market	Coxage	0.26	0.44	0	1
	Orgseller	0.71	0.46	0	1
	Soldatnew	0.00	0.07	0	1
Buying Center Price	Buypred (Center)	670.87	21.53	652.15	710.66
Scale	Amount	92.15 (42.0)	132.55	1	750
	Qinv	0.05	0.09	0.001	1
Credit	Totcred	0.23	0.42	0	1
Quality	Quality	0.55	0.50	0	1
	Qualmat	0.36	0.48	0	1

Table 3: Descriptive Statistics for South Province Buying Center Price Transmission Regressions

Category	Variable	Mean (Median)	Std Dev	Minimum	Maximum
Farmgate Prices	Realprice	476.95	63.04	250	630
	Someprevreal2	476.58	63.01	250	630
	Allprevreal	474.97	63.50	250	630
Buying Center	Buycntr (Ngmzp)	0.60	0.49	0	1
Infrastructure and Market Information	Vildist	18.23	9.55	0	38.75
	Graded	0.39	0.46	0	1
	Winfo	0.38	0.49	0	1
Agents / Market	Coxage	0.80	0.40	0	1
	Orgseller	0.06	0.24	0	1
	Soldatnew	0.06	0.23	0	1
Buying Center Price	Buypred (South)	525.50	17.29	510.84	575.69
Scale	Amount	118.64 (75.0)	124.19	2	697.5
	Qinv	0.03	0.06	0.001	0.5
Credit	Totcred	0.24	0.43	0	1
Quality	Quality	0.79	0.41	0	1
	Qualmat	0.61	0.49	0	1

Table 4: Descriptive Statistics for Southwest Province Buying Center Price Transmission Regressions

Category	Variable	Mean (Median)	Std Dev	Minimum	Maximum
Farmgate Prices	Realprice	595.73	43.39	417	708
Buying Center	Buycntr (Tombel)	0.47	0.50	0	1
Infrastructure and Market Information	Vildist	21.62	7.77	0	33.8
	Graded	0.36	0.39	0	1
	Winfo	0.06	0.24	0	1
Agents / Market	Coxage	0.44	0.50	0	1
	Orgseller	0.01	0.10	0	1
	Soldatnew	0.04	0.21	0	1
Buying Center Price	Buypred (Southwest)	675.28	11.84	659.90	688.31
Scale	Amount	841.50 (466.0)	1711.25	4	20400
	Qinv	0.01	0.02	0.00005	0.25
Credit	Totcred	0.70	0.46	0	1
Quality	Quality	0.72	0.45	0	1
	Qualmat	0.03	0.18	0	1

Table 5: Buying Center Price Transmission Regression Results for Center Province

Category	Variable(s)	Coefficient	Province		
			<i>Realprice</i>	<i>Someprev</i>	<i>Allprev</i>
n			221	221	221
Adj. r²			0.67	0.53	0.46
Intercept		α_0	-8.47 (0.943)	20.97 (0.876)	-36.14 (0.791)
Buying Center	I^j	α_1	-28.72 (0.003)	-30.53 (0.004)	-34.58 (0.001)
	I^j				
	c_e	β_1	1.29 (0.088)	0.51 (0.544)	-0.06 (0.941)
Infrastructure	c_e	β_2	-2.65 (0.783)	-0.25 (0.980)	3.85 (0.719)
Market Information	I_f	β_3	15.35 (0.055)	23.17 (0.012)	19.72 (0.028)
	I_e	γ_1	-42.88 (0.032)	-33.60 (0.108)	-32.68 (0.125)
	I_f	γ_2	81.58 (0.000)	55.07 (0.006)	22.82 (0.259)
Agents	c_f	γ_3	58.67 (0.011)	57.21 (0.016)	47.64 (0.047)
Downstream Price	P_w	P_w	0.87 (0.000)	0.83 (0.000)	0.93 (0.000)
Scale	c_e	Q	-120.75 (0.006)	-132.99 (0.008)	-132.47 (0.004)
Credit	I_f	δ	-5.29 (0.524)	-2.77 (0.762)	5.45 (0.573)
	I_e	τ_1	-33.80 (0.000)	-40.64 (0.000)	-41.78 (0.000)
Quality	I_f	τ_2	-25.10 (0.015)	-19.52 (0.089)	-22.60 (0.048)

Table 6: Buying Center Price Transmission Regression Results for South Province

Category	Variable(s)	Coefficient	Province		
			<i>Realprice</i>	<i>Someprev</i>	<i>Allprev</i>
n			176	176	176
Adj. r²			0.32	0.31	0.30
Intercept		α_0	97.48 (0.423)	93.06 (0.447)	86.69 (0.491)
Buying Center	I^j <i>Buycntr</i> (Ngomedzap)	α_1	5.62 (0.640)	5.73 (0.635)	4.75 (0.698)
Infrastructure	c_e <i>Vildist</i>	β_1	0.21 (0.726)	0.22 (0.716)	0.20 (0.746)
	c_e <i>Graded</i>	β_2	-22.29 (0.099)	-21.93 (0.106)	-22.98 (0.087)
Market Information	I_f <i>Winfo</i>	β_3	3.61 (0.646)	3.30 (0.675)	2.98 (0.711)
Agents	I_e <i>Coxage</i>	γ_1	-12.35 (0.183)	-12.61 (0.178)	-14.96 (0.117)
	I_f <i>Orgseller</i>	γ_2	4.31 (0.838)	-1.50 (0.945)	-28.40 (0.239)
	c_f <i>Soldatnew</i>	γ_3	-3.46 (0.854)	-3.20 (0.866)	-3.62 (0.849)
Downstream Price	P_w <i>Buypred</i>	P_w	0.86 (0.000)	0.87 (0.000)	0.89 (0.000)
Scale	c_e <i>Qinv</i>	Q	-387.64 (0.000)	-389.20 (0.000)	-392.38 (0.000)
Credit	I_f <i>Totcred</i>	δ	4.78 (0.542)	4.30 (0.585)	3.00 (0.714)
Quality	I_e <i>Quality</i>	τ_1	-47.30 (0.001)	-47.84 (0.001)	-49.02 (0.001)
	I_f <i>Qualmat</i>	τ_2	-22.56 (0.058)	-21.32 (0.071)	-19.17 (0.112)

Table 7: Buying Center Price Transmission Regression Results for Southwest Province

Category	Variable(s)	Coefficient	Province	
			<i>Realprice</i>	
n			313	
Adj. r²			0.23	
Intercept		α_0	487.86 (0.000)	
Buying Center	I^j	<i>Buycntr</i> (Tombel)	α_1	20.35 (0.000)
Infrastructure	C_e	<i>Vldist</i>	β_1	-0.89 (0.011)
	C_e	<i>Graded</i>	β_2	-4.49 (0.469)
Market Information	I_f	<i>Winfo</i>	β_3	16.51 (0.027)
Agents	I_e	<i>Coxage</i>	γ_1	-5.87 (0.353)
	I_f	<i>Orgseller</i>	γ_2	-5.48 (0.325)
	C_f	<i>Soldatnew</i>	γ_3	-24.54 (0.053)
Downstream Price	P_w	<i>Buypred</i>	P_w	0.22 (0.200)
Scale	C_e	<i>Qinv</i>	Q	-835.58 (0.000)
Credit	I_f	<i>Totcred</i>	δ	-9.23 (0.060)
Quality	I_e	<i>Quality</i>	τ_1	-16.32 (0.005)
	I_f	<i>Qualmat</i>	τ_2	-33.72 (0.001)

Table 8: Estimated Discounts by Amount and Province for LIFFE and Buying Center Regressions in FCFA

Amount (kg)	Buying Center Regression (FCFA)		
	Center	South	Southwest
1	-120.8	-387.6	-835.6
15	-8.1	-25.8	-55.7
30	-4.0	-12.9	-27.9
45	-2.7	-8.6	-18.6
60	-2.0	-6.5	-13.9
75	-1.6	-5.2	-11.1
90	-1.3	-4.3	-9.3
105	-1.2	-3.7	-8.0
120	-1.0	-3.2	-7.0
135	-0.9	-2.9	-6.2
150	-0.8	-2.6	-5.6