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# What determines the price received by farmers? The case of cocoa in Cameroon

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## Abstract

Various works have demonstrated that small-scale agricultural producers from developing countries do not generally obtain the potential gains linked to marketing. What can be done to help them obtain better prices? In this article, we examine two different solutions: increasing the bargaining power of individual producers and collective marketing through producer organizations (POs). We use data on 2,487 cocoa transactions undertaken by producers in Cameroon during the 2005/2006 season (IITA survey 2006). We first of all explore bargaining theories to identify the determinants of the price received by producers who sell their produce individually, and the, analyse the effect of collective marketing. We show that when the bargaining situation is least favourable to the producers (because the prices are non-negotiable and there is information asymmetry which favours the traders), the traders seize the entire surplus generated by the trade. In order to improve the prices received by producers, it should be necessary to manage their access to credit (so that they will not be bound to any buyer the had obtained credits from, thus ameliorate arbitrate and negotiate the price), and enable them delay their sale until after the start of the school year (so that traders could no longer know the producers financial need). We also show that selling produce via the POs generally results in a price increase of 9% caused by improvement in a reduction in transaction costs (through economies of scale) and improved bargaining power. The article also examines whether or not the mere presence of a PO in a specific zone enables all the producers in this zone (even those who sell individually) to benefit from higher prices. However, a clear conclusion does not arise in this respect.

Key Words: Reservation price, information, bargaining, collective marketing, price, cocoa

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# I. Introduction

Many empirical studies have been conducted in developing countries to explain the prices received by agricultural producers. The first analyses (undertaken in the years following agricultural liberalisation in developing countries) generally concluded that small-scale producers are unable to take any real gain potentially from selling their product. This was explained by the high level of transaction costs and the numerous constraints facing the producers. These constraints include means of transport, a lack of access to credit etc. (De Janvry et al., 1991; Goetz, 1992). Recent studies also show that producers remain poorly connected to the market and the traders seize generally the gains from trade (Key et al. 2000; Gabre-Madhin 2001; Gabre-Madhin 2009). For example, numerous producers are bound to buyers who lend them money, thereby preventing them from capitalizing on the existing competition and obliging them to accept lower prices (Gockowski 2008). We therefore explore the different ways of strengthening the bargaining power of agricultural producers in view of enabling them obtain better prices for their products.

One solution is to strengthen the bargaining power of individual producers. Theoretically, this refers to bargaining theory which explains how the surplus generated by trade is divided between the buyer and the seller (Stahl 1972; Rubinstein 1982; Binmore 1987; Wilson 1995; Corominas-Bosch 2004). This theory analyses the main determinants of the distribution of the surplus (such as information available to the different operators and the price-setting rules). It therefore allows us to identify the variables that can be influenced with in view of altering the distribution in favour of the producers. This theory has given rise to numerous tests in experimental economics. It has been sparsely, if not, never used in empirical studies aimed at explaining agricultural prices in developing countries. This is surprising and

regrettable as improving or strengthening the bargaining power of small-scale producers is one of improving farmer's income and reducing poverty.

Another solution involves promoting collective marketing by producer organisations (POs). Collecting large volumes (economies of scale) minimize transaction costs at the same time increasing the bargaining power of the producers. Various works confirm that producers genuinely obtain a higher price when they sell their produce via a PO (Coulter et al. 1999; Bernard et al. 2008). Certain POs even claim that their mere presence within a given zone alters the market structure in favour of producers as a whole (even those who sell their produce individually). Such an "indirect" effect of POs has not been tested in empirical studies with regard to agricultural markets in developing countries.

These two solutions (strengthening the bargaining power of individual producers and strengthening the forms of collective marketing) are not mutually exclusive but complementary. In the wake of liberalisation, collective marketing by POs gave cause for great hope (De Janvry et al., 1991; Goetz, 1992). It remains an attractive solution today, although its limitations have also become clear. POs sometimes have difficulty in merging and, if they do, it is difficult organising themselves to market their members' products. POs sometimes operate very effectively, and obtain relatively high prices though only acquiring a relatively small share of the quantities produced by their members (Bernard et al. 2008).

The aim of the present article is to examine these two solutions with regard to the cocoa market in Cameroon. Cocoa plays an important economic and social role in Cameroon: 6% of exports in 2006; a contributory 115 billion FCFA to the national economy. There are approximately 260,000 planters and a total surface area covering 400,000 ha is attributed to cocoa crops. Before liberalisation, the domestic cocoa market was strictly regulated. The state supplied the inputs, set the price of cocoa, collected the goods from the producers (via the intermediary of "cooperatives") and controlled exports. The liberalisation of cocoa marketing

which occurred in 1995 resulted in an increase in the price received by the producer together with an increase in the variability of this price (Vrije Universiteit of Amsterdam, 1999). Furthermore, the quality of Cameroonian cocoa declined. Generally speaking, as a result of market imperfections, the expected results of the liberalisation policy have never achieved the desired level (Bernard 2003; Okah-Atenga, 2005). Consequently, producers often find themselves in a weak bargaining situation vis-à-vis buyers (Gockowski 2008). This is particularly the case when producers are bound to a buyer or when they sell their goods outside the main harvesting period (September to December) as the buyers relatively few in number at that time. The risk of the cocoa becoming damaged if it is not stored in the appropriate conditions (protection against humidity and insects) is also a major obstacle for producers (and even for POs).

After liberalisation, producer organisations (POs) began to appear but only in certain regions. In the "Centre" region, the former state cooperatives disappeared. POs primarily grew up thanks to the support of development projects such as the *Sustainable Tree Crop Program* based at the IITA. According to Folefack and Gockowski (2004), 40% of the cocoa producers in the "Centre" region are members of a PO. These POs can in part be seen as a response to the withdrawal of the state insofar as they attempt to replace it in terms of supplying producers with inputs and marketing operations. In "Southwest" region, the former cooperatives (such as the *Southwest Farmer Cooperative Union* based in Kumba) were placed in the hands of traders (who are also often producers). Although they sometimes present themselves as POs, these "commercial CIC[1]s" and "buyer cooperatives", pre-financed by approved buyers or exporters, are in fact purchasing bodies acting on behalf of the traders. In the absence of projects supporting producers' initiatives, no POs have been able to emerge in the Southwest region. These different development patterns can also be explained by the

[1] Common Initiative Group

structural differences between the two regions (which are the two main cocoa-producing regions in the country). Due to its agro-climatic characteristics, the Southwest region is more favourable to cocoa production. Moreover, the farms in this region are larger (on average three times larger), production is more intensive and output is three times higher (900-1,000 kg / ha compared to 300-450 kg / ha in the central region) (Vrije Universiteit of Amsterdam, 1999). Although the surface area is smaller and there are three times fewer producers in the region, the Southwest produces more cocoa than the Centre.

This article aims at explain in the differences in the price received by cocoa producers in Cameroon. It is based on data on 2,487 transactions conducted by 904 producers in the Centre and Southwest regions. These data are taken from a survey conducted in 2006 by the IITA. First, in the case of individual sales, we highlight the effect of the bargaining situation on the price received by the producers. We then estimate the effect of the POs. The fact that two types of marketing process (individual and collective sales) coexist in the Centre province allows us to estimate the "direct" effect of the POs, i.e. the price increase resulting from the act of selling via a PO. The fact that POs exist in one region and not in the other allows us to analyse the "indirect" effect of the POs, i.e. the effect resulting from the existence of POs in a specific zone on the price received by producers who choose to sell individually. We will present a review of the literature concerning bargaining theories before formulating and testing hypotheses concerning the determinants of the prices received by cocoa producers in Cameroon. We will then discuss the implications of these results for development policies.

## II. Theoretical framework: bargaining theories

Bargaining theories attempt to explain price setting. For a transaction to be conducted, the buyer and seller must both derive a certain level of satisfaction. The price is therefore

necessarily a compromise between the seller's reservation price (the price below which there is no percentage in conducting the transaction) and the buyer's reservation price (the price above which there is no percentage in conducting the transaction). The aim of bargaining theories is precisely to explain where the price will be set within the bargaining range defined by the two reservation prices. They explain prices based on the characteristics of the bargaining situation, the reservation prices being considered as exogenous data. In practice, price differences between producers may result from differences in the bargaining situation or from differences in the producer's or buyer's reservation prices. Any empirical analysis must therefore incorporate data concerning both the bargaining situation and the reservation prices.

What might be the effect of collective marketing via POs? This phenomenon can alter the bargaining situation *and* the reference prices in favour of the producers. It may also (as is the case of cocoa in Cameroon) result in a change in the scale of the bargaining process (shift from bilateral negotiations to multilateral negotiations).

We will therefore present bilateral bargaining theories and then explore the role that POs might play in setting prices.

Bargaining theories have shown that making the first price proposal often plays a crucial role in the process. To simplify the presentation, we will consider that the buyer always makes the first proposal (this corresponds to the prevailing situation on the cocoa market in Cameroon). The difference between the buyer's reservation price and that of the seller represents the surplus generated by the trade. It also defines the bargaining range. Three categories of variable determine where the price will be set within this bargaining range:

- The characteristics of the operators represented, in particular through their *level of risk aversion* and their *level of impatience.* Risk aversion is a psychological element which determines the influence of risk on the well-being of the operator (and thus on

his behaviour). The level of impatience reflects the fact that the utility of the operators falls if the negotiation prolongs. This is due both to the opportunity cost of the time spent bargaining and to the disutility which might result from having the money (for the seller) or the product (for the buyer) at a later date.

- The market institutions which determine price-setting measures, in particular *the identity of the party who makes the first price proposal* (buyer or seller) and *the possibility of bargaining* ("take it or leave it" price versus a negotiable price).
- The distribution of the information between the buyer and the seller. This information concerns the respective characteristics of each party (reservation price, risk aversion, rate of impatience, level of information). Four situations are theoretically possible: i) complete information ii) asymmetric information where only the buyer is informed iii) asymmetric information where only the seller is informed and iv) asymmetric information on both sides.

Coupling these different categories of variable leads to numerous bargaining situations being defined, most of which have been studied in the literature. It is therefore possible to classify the literature according to the bargaining situations studied. The table below (table1) summarize this by coupling the *price setting rules* (take it or leave it price *versus* a negotiable price) with *the information available to the two operators* (cf. table 1). Naturally, in addition to the situations presented in the table (information and price setting rules), the result of the bargaining process depends on the characteristics of the operators, in particular risk aversion and the rate of impatience.

Table 1: The different bargaining situations and the literature in which they have been studied

| **Price setting rules**<br><br>**Distribution of information** | Take it or leave it | Negotiable |
|---|---|---|
| Complete information | Trivial case | Stahl (1972), Rubinstein (1982), Binmore (1987), Wilson (1987), Corominas-Bosch (2004) |
| Asymmetric information (party informed = the party who makes the first proposal) | Trivial case | Cramton (1984), Fudenberg et al (1985), Grossman and Perry (1985), Gul and Sonnenschein (1985), Wilson (1987), Corominas-Bosch (2004) |
| Asymmetric information (party informed = the party who does not make the first proposal) | Classic case of decision-making in a situation of uncertainty: | Coase (1972), Sobel and Takahashi (1983), Cramton (1984), Bikhchandami (1985), Fudenberg et al (1985), Rubinstein (1985), Gul et al (1986), Wilson (1987), Corominas-Bosch (2004) |
| Incomplete information on both sides | Classic case of decision-making in a situation of uncertainty: | Cramton (1984), Fudenberg et al. (1985), Wilson (1987), Dajun and Katia (1997), Watson (1998), Corominas-Bosch (2004). |

In a situation of *complete information*, if the price is non-negotiable, the result is trivial: the *price-maker* sets the price at the level of the other operator's reservation price and takes the entire surplus. When the price is negotiable, the solution is a little more complex. The operators can "draw out" the negotiations, hence the importance of the rate of impatience of both the buyer and the seller. Rubinstein (1982) analysed the case where both operators have the same rate of impatience. In this situation, the utility of an operator i depends on both the share of the potential surplus that he obtains (x) and the period during which he obtains it (t) using the formula Ui (x , t) = x _$^{t-1}$, where _$^{t-1}$ lies between 0 and 1 and represents the update coefficient. Rubinstein shows that the operator who makes the first price proposal obtains $\frac{1}{1-\delta}$ while the other operator obtains $\frac{\delta}{1-\delta}$. If _ = 0, both operators are extremely impatient: any surplus disappears at the second period. The situation is therefore comparable

to that of the "take it or leave it" price: any surplus is seized by the operator who makes the initial price proposal. When _ tends to 1 (operators are infinitely patient), the surplus tends to be equally distributed. This model (in which the only variable distinguishing between the two operators is the right to make the first proposal) shows that the market power resulting from this right is correlated to the common impatience of the operators. Naturally, one operator may be more patient than the other, thereby giving him an advantage.

In a situation of *incomplete information,* an operator who is poorly or insufficiently informed risks taking the wrong decision. The intensity of this risk falls as his level of information increases. The effect of this risk on the behaviour of the operator depends on his level of risk aversion. If information is *asymmetric*, the informed operator enjoys a significant advantage. If the *informed operator also makes the first price proposal*, both effects support one another enabling him to seize the majority of the surplus. Even if the price is negotiable, the operator who does not make the first price proposal (under our assumption the producer) will find it difficult to play for time, even if he is patient. The truth is that he does not know the reservation price or the rate of impatience of the other operator (under our assumption the buyer). He therefore runs the risk by being too greedy, of causing the negotiations the break down. He will therefore be encouraged not to bargain too aggressively (especially if he is risk-averse). The situation in which *the informed operator does not make the first price proposal* is more subtle and more complex. *In a situation where prices are non-negotiable*, the result primarily depends on the risk aversion of the operator who makes the first price proposal (under our assumption the buyer): the greater his aversion to risk, the higher the price he will propose so as to minimise the risk that the negotiations break down. In a *situation where prices are negotiable*, a Coasian (1972) result applies. Coase demonstrated that if the informed operator is patient and the uninformed operator is impatient, the former can seize the majority of the surplus even if it is the latter who makes the first price proposal.

In a situation of *incomplete information for both parties*, both operators are subject to risk. *In a situation where the price is non-negotiable,* making the first price proposal remains an advantage: the *price-maker* will generally obtain a larger share of the surplus unless he is hugely risk-averse. In the situation where prices are negotiable, it is generally the most patient operator who will succeed in obtaining the majority of the surplus, even if the different levels of risk aversion would suggest otherwise (Cramton 1984; Watson 1998).

The following table attempts to summarise the main results from the literature concerning each bargaining situation:

Table 2: Summary of the theoretical results concerning the determinants of the allocation of the surplus in the different bargaining situations.

| Price setting rules<br><br>Distribution of the information | Take it or leave it | Negotiable |
|---|---|---|
| Complete information | The *price-maker* takes the entire surplus. The price is equal to the reservation price of the other operator. | The possibility of "playing for time" enables the operator who does not make the first price proposal to obtain a share of the surplus, especially if both operators are patient (Rubinstein 1982) and even more so if he is more patient than the operator who makes the first price proposal. |
| Asymmetric information (party informed = the party who makes the first proposal) | The *price-maker* takes the entire surplus. The price is equal to the reservation price of the other operator. | The possibility for the operator who does not make the first price proposal to obtain a share of the surplus by playing for time is reduced due to the fact that he does not know the other operator's parameters (reservation price, rate of impatience), especially if he is risk-averse. |
| Asymmetric information (party informed = the party who does not make the first proposal) | The *price-maker* will generally obtain a larger share of the surplus. The allocation depends on the level of information and risk aversion of the *price-maker*. | The allocation of the surplus primarily depends on the rate of impatience of the two operators. If the informed operator is patient and the uninformed operator is impatient, the former can obtain the majority of the surplus, even if it is the latter who makes the first price proposal (Coase 1972). |
| Incomplete information on both sides | The *price-maker* will generally obtain a larger share of the surplus. The allocation depends on the level of information and risk aversion of the *price-maker*. | The most patient operator will generally succeed in obtaining the majority of the surplus, even if the difference in risk aversion would suggest otherwise (Cramton 1984; Watson 1998). |

What is the effect of collective marketing via POs on the prices received by producers? The evidence suggests that POs can modify *the bargaining situation* in favour of the producers (Bernard et al. 2008). The POs are indeed often better informed, less impatient and perhaps less risk-averse than the individual producers. A PO can also be in a better position to negotiate prices than an individual producer. However, the PO may also have an effect *on the reservation prices*. Hence, selling large quantities may increase the buyers' reservation price, (Coulter et al. 1999). On the one hand, transaction costs are reduced as fixed costs are shared (such as the opportunity cost of the time spent negotiating). On the other hand, the probability of finding an equivalent quantity quickly if negotiations break down is much lower. Recourse to collective marketing can therefore increase the price received by the producers by two ways: by modifying the bargaining situation and by modifying the reference prices in favour of the producers.

Collective marketing may also result in a change the scale of bargaining from bilateral negotiations when producers sell individually to multilateral negotiations when producers sell via POs. As we will see later, this is the case for cocoa in Cameroon. Each PO organises "market days" during which it negotiates simultaneously with several buyers. Asymmetric multilateral bargaining (for example, a seller negotiating simultaneously with several buyers) is naturally more advantageous for an operator who can capitalize on the competition (Serrano 2008).

Finally, we might imagine that the presence of a PO within a zone intensifies competition between buyers and thus, they adopt higher reservation prices. The presence of POs could therefore increase the prices received by producers that sell individually. This would provide a theoretical justification of the "indirect" effect of POs.

The fact remains that the impact of POs on the prices received by the producers is still poorly documented. These questions therefore seem pertinent. Do POs really enable the producers

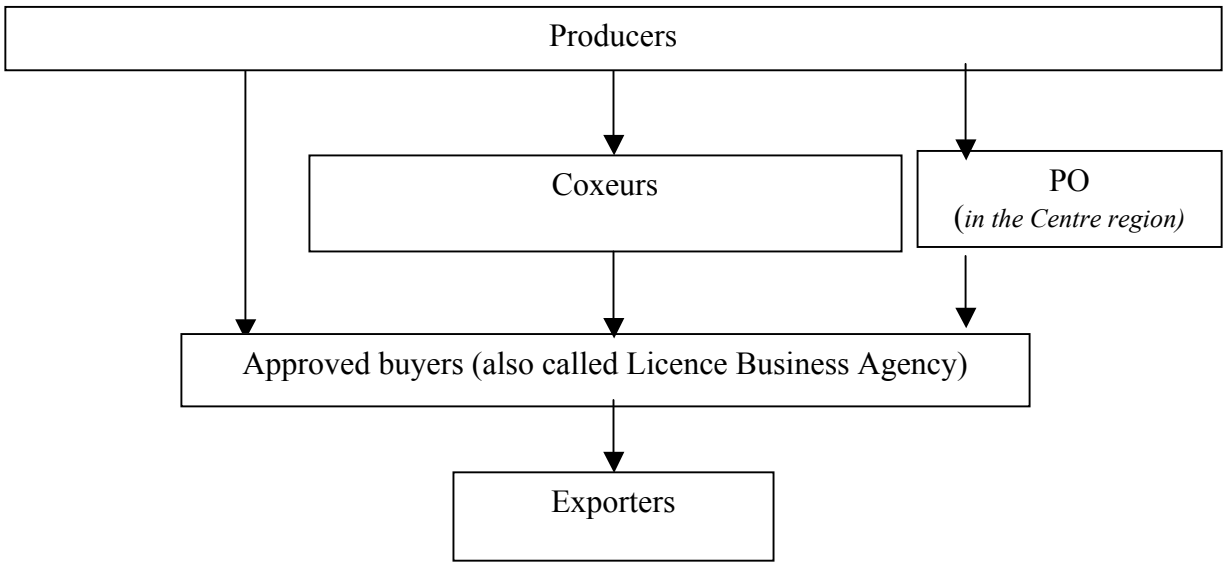
who sell via these organizations to obtain better prices? Do they have indirect beneficial effects on the producers in the zones where they are located (even for those who do not sell their goods via the POs)? What is the extent of these effects (in particular in relation to other factors which might enable producers to obtain better prices)?

This theoretical explanation of the determinants of the price received by the producer leads us to formulate a number of hypotheses concerning the cocoa market in Cameroon.

## III. Hypotheses concerning the determinants of the prices received by cocoa producers in Cameroon

We have seen that the price level depends on the bargaining situation which itself may be characterised in part by coupling the price setting rules (take it or leave it price versus a negotiable price) with the information available to the two operators. The first stage therefore involves characterising, from this point of view, the main bargaining situations in which Cameroonian cocoa producers find themselves. The structure of the cocoa marketing chain is relatively simple (cf. figure 1).

Figure 1: Organisation of the cocoa marketing chain in Cameroon



The producers can either sell directly to approved buyers (but this often requires a long journey as the latter are based in the towns), sell to coxeurs[2] (who generally buy the cocoa from the producers and resell it to approved buyers) or entrust the sale of their cocoa to a PO which then sells it to the approved buyers. The first marketing channel (selling directly to approved buyers) is primarily the domain of large-scale producers[3]. It is not widespread in the Centre region (it represents only 5% of the number and volume of transactions), but very widespread in the Southwest (53% of transactions and 59% of the volume traded). The second channel (selling to coxeurs) represents about half of the trade both in the Centre (51% of transactions and 47% of the volume traded) and in the Southwest (47% of transactions and 41% of the volume traded). The third channel (selling via a PO) only exists in the Centre where it accounts for almost half of the trade (44% of transactions and 48% of the volume traded). As we have already explained, there are no POs in the other production region, i.e. the Southwest. The approved buyers then resell the cocoa to exporters. This marketing chain is "funnel-shaped": with 160,000 producers across the two zones, there are about 1,000 coxeurs who sell the produce to approximately 35 approved buyers. At the end of the chain, three exporters control almost all the cocoa produced[4]. The cocoa is moved from the farms to the villages (where the coxeurs and POs collect the cocoa) before being transported to small provincial towns (home to the approved buyers) before finally reaching the port of Douala (where the exporters are based).

Characterizing the bargaining situation facing the producers depends on the marketing channel concerned. For producers selling individually (to approved buyers or coxeurs), the first price proposal is always made by the cocoa buyer. This price can be negotiable as well

[2] Coxeurs are collectors working for an approved buyer. They are paid on commission.
[3] This is convergent with the result obtained by Fafchamps and Vargas (2004) whereby only producers with large quantities travel to sell their product.
[4] These are Cargill, ADM and OLAMCAM

as non-negotiable. Certain producers are bound to a coxeur or an approved buyer because of credit that had been extended to the price by the buyer (bound transaction). In this case, producers cannot capitalize on competition between buyers. Furthermore, they can no longer negotiate the price with "their" buyer. On the other hand, producers who have not obtained credit from the cocoa buyers can make counter-proposals (bargaining). In this case, the negotiations can be protracted. The *coxeur* may visit the producer in the morning before paying him during a second visit in the evening (at the end of his round) or even the following day. The producers are always poorly informed on the situation of the buyers. The buyers are also in a situation of uncertainty with regard to the producers' situation (reservation price and rate of impatience), except at the start of the school year when almost all cocoa producers need money relatively quickly. Thus, in the case of individual sales, the bargaining situation can be defined according to two variables: the existence of credit granted by the buyer to the producer (which indicates whether or not the price is negotiable) and the selling period (the start of the school year acts as a proxy for asymmetric information between buyer and producer). This leads us to identify the following bargaining situations for cocoa producers in Cameroun (cf. table 3):

Table 3: Summary of the different bargaining situations of cocoa producers in Cameroon (individual sales).

| Price setting rules<br><br>Distribution of the information | Take it or leave it | Negotiable |
|---|---|---|
| Asymmetric information (informed party = the buyer) | S0. Individual sales with buyer credit at the start of the school year | S1. Individual sales at the start of the school year (without buyer credit) |
| Incomplete information on both sides | S2. Individual sales with buyer credit at times other than the start of the school year | S3. Individual sales at times other than the start of the school year (without buyer credit) |

According to the different bargaining situations, the price is set at a different level within the interval between the two reservation prices. In situation S0, the price will theoretically be set at the level of the producer's reservation price (the buyer seizes the entire surplus). The share of surplus obtained by the producer (i.e. the weight of the buyer's reservation price in the price-setting process) increases as we shift to towards S1 or S2 and the greatest share is obtained at situation S3. Hence, if it is not the start of the school year (situations S2 and S3), the buyer is poorly informed concerning the producer's reservation price and their rate of impatience, a situation which may lead the buyer to pay a higher price. This enables us to formulate the following hypotheses concerning the determinants of the prices received by the producers:

***H1****: In situation S0 (producers bound to the buyer by credit and the start of the school year), only the producer's reservation price influences the price (the buyer's reservation price has no effect on the price).*

***H2:*** *The price received by the producers is higher in bargaining situations S1 and S2 than in situation S0. It is even higher in situation S3.*

In theory, sales via POs should always be more favourable to producers than individual sales. In the case of sales via POs, the information is distributed symmetrically and the price is negotiable (the first price proposal always coming from the buyers). We therefore find ourselves in a situation which is at least as favourable as the most favourable bargaining situation in the case of individual sales (S3). Moreover, unlike the case of individual sales, the POs negotiate with several buyers simultaneously (multilateral bargaining), this enable them to capitalize on competition. The POs determine a "schedule of market days" which is communicated to the buyers. On the market days in question, a number of approved buyers visit the premises of the PO to participate in the negotiations (in generally Pos paying an entry ticket costing around 10,000 FCFA). The PO's marketing managers (representing the

producers selling cocoa) announce the quantity that the PO has to sell and the buyers make their buying proposals in public. The PO negotiates and generally comes to an agreement with one of the buyers[5]. In theory, sales made via a PO should always be more favourable to the producers than selling individually. This gives rise to the following hypothesis:

***H3:*** *Selling via the POs should enable producers to benefit from a higher price ("direct" effect of the POs).*

This hypothesis can only be tested in the Centre region as this is the only region where POs exist. We might also imagine that the presence of the POs in this region could alter market operations in favour of the producers (better information, increased competition between buyers etc.), even if they do not sell their produce via the POs. This leads us to formulate the following hypothesis:

***H4:*** *The presence of POs within a zone enables the producers to obtain a better price, even if they sell individually ("indirect" effect of the POs). All things being equal, producers who sell individually in the Centre region – where the POs exist – should therefore benefit from a higher price than their counterparts in the Southwest – a region where there are no POs.*

This analysis should nevertheless be undertaken with caution, as the presence of POs is not the only difference between the two regions.

As the price received by the producer depends on both the bargaining situation and the producer's (PRP) and the buyer's (BRP) reservation prices, we require information concerning the reservation prices in order to test our different hypotheses. This is difficult in empirical studies as the reservation prices involve opportunity costs (and not only the real

[5] When a purchase is agreed, the buyer pays 20% of the total amount of the purchase. The two parties then collect and weigh the cocoa and check the quality in the different PO storage points. Once the collection is complete, the remaining amount is paid to the PO with an upward or downward adjustment according to the difference between the estimated and real quantities.

costs to which the operators are subjected). We must therefore examine the reservation prices by means of different proxies.

The producer's reservation price (PRP) represents the threshold price below which it is preferable for the producer not to make the transaction. The PRP therefore depends on a) the costs paid by the producer (if the price is lower than the average cost, the producer loses money); b) the price he hopes to obtain with other operators; and c) the consequences with which he will be confronted if he does not succeed in selling his product quickly to another operator.

The costs borne by the producers include production costs, transport costs and transaction costs. Production costs are generally lower in the Southwest than in the Centre (the Southwest is much more favourable to cocoa from a agro-climatic point of view). The transport costs of cocoa can be estimated by the distance between the producer's house and the point of sale (even if they are also affected by other parameters such as the condition of the tracks and the means of transport available to the producer). This distance also gives us an idea of the transaction costs borne by the producers (costs involved in the travel to the point of sale, including the opportunity cost of time)[6]. Transaction costs may also include contributions to the POs (these vary between 10 and 50 FCFA per kilogramme depending on the PO) and the losses resulting from manipulative tactics employed by the buyers in evaluating the rate of humidity of the cocoa[7]. The transaction costs also depend in part on the quantities sold (economies of scale).

[6] The point of sale depends to a large extent on the marketing channel adopted: the producer's house (if selling to a coxeur), the "cocoa purchasing centres" located in the local administrative capitals (if selling to an approved buyer) or the PO store.

[7] The buyer measures the rate of humidity as this gives an idea of the weight lost by the cocoa during the drying process. According to official standards, the normal rate of humidity is 8%. For every additional one percent in the rate of humidity, the buyer deducts one kg of cocoa per 75-kg sack: this is the "deduction". Only the approved buyers have hygrometers: the coxeurs estimate the rate of humidity in a more subjective manner by breaking open the bean.

The *price that the producer hopes to obtain from other operators* depends on the information available to the producer concerning international prices and the extent to which the producer can capitalize on the competition between buyers. On the cocoa market in Cameroon, the producers do not all have the same *level of information concerning the prices*. According to his possibilities, the producer can obtain information via the Market Information System[8] introduced by the ONCC, or National Coffee and Cocoa Board (requiring the availability of a mobile phone). He can also obtain information from the media (radio, TV and press), from the POs, his neighbours or even the buyer. The level of competition depends on the binding practices between the producers and the buyers and on the number of buyers present in the zone. The producer can be bound to a buyer if the latter grants him credit in the form of cash or inputs ("bound transactions"). Gockowski's (2008) study on the impact of credit on cocoa marketing in Cameroon shows that producers who receive a credit from the buyer obtain prices which are significantly lower than other producers. If the producer is not bound by credit, the possibility of capitalizing on competition depends primarily on the number of buyers in the zone.

The *consequences if the producer does not succeed in selling his produce quickly* primarily depend on the producer's financial needs. These in turn depend on the level and degree of his income diversification and sometimes also on the occurrence of seasonal expenditure for agricultural activities or family consumption (such as the start of the school year).

The buyer's reservation price (BRP) represents the price below which it is preferable for the producer not to make the transaction. The BRP therefore depends on a) the buyer's resale price; b) the transport and transaction costs borne by the buyer; c) the price and quantities that they hope to obtain with other operators (a price which in turn depends on the seasonality and

8 This information system involves sending the SMS "cocoa" using a local mobile phone and receiving the CIF and FOB prices in effect on that particular day. This price is communicated via an ONCC server. However, this practice is not well-known among producers.

number of buyers present in the zone); and d) the potential damage to his reputation if he does not succeed in satisfying the demand of his customers.

The buyer's resale price depends on the international price converted into FCFA and the number of intermediaries separating him from the exporter, as approved buyers are closer than the coxeurs to the exporters[9]. The *transport costs* are linked to the distance between the place of purchase and the place of delivery of the cocoa (the port of Douala) as well as the condition of the roads.

The *transaction costs* borne by the buyers primarily depend on the *volumes sold* by the producer or the PO (economies of scale), formal and informal *taxes* to which they are liable and the costs of the services acquired in order to keep the producers' or POs' supply. Consequently, in particular in the Centre region, the *coxeurs* are sometimes the target of "rackets" by the authorities (in principle, only approved buyers are authorized to buy cocoa). In the Southwest, the coxeurs sometimes come together as a CIG, and this is liable to formal taxes. The entrance ticket paid to participate in "market days" organized by certain OPs must also be taken into account. The cost of credits agreed in order to reserve the supply such as credits granted to farmers during production, cash advances paid to POs to guarantee the purchasing contract. That compel the producer to reserve their product is also important. For the *coxeurs*, we must also take into account the costs of the different services which they provide to the producers during or outside the cocoa marketing campaigns. For example, they act as intermediaries for the purchase of inputs, food products "from town" (rice, soap, smoked fish etc.) and sometimes building materials.

*The price and quantity that a buyer hopes to obtain with other producers primarily depends* on the number of rival buyers present in the zone, the possible presence of POs within the

9 The resale price is generally known to the buyers when they negotiate with the producers. The buyers benefit from weekly, monthly or quarterly forward contracts agreed with their customers.

zone and the seasonal nature of production (during the main harvest period, the buyers are willing to pay more as the cocoa is better quality and the competition is intensified by the presence of numerous buyers).

## IV. Data

The data that used to test our hypotheses obtained form a study which we conducted with the International Institute of Tropical Agriculture (IITA) in 2006. This study examined two provinces (the centre and the South-west) which account for the vast majority (85%) of cocoa production in Cameroon. The data was collected using a single questionnaire taken from the baseline survey of the STCP project (*Sustainable Tree Crop Programme*). The aim of this survey was to record the sociological, economic and agronomic characteristics of perennial crop producers. We incorporated a new section in the questionnaire dealing with cocoa marketing. The surveys were conducted during the period February-April 2006. We accompanied the teams in the field and supervised the implementation of the surveys directly. As a census of the cocoa producers was not available, we adopted the following sampling method. We visited almost all the villages in the 12 *Divisions* of the Centre (8) and Southwest (4) provinces. The district chiefs, the local delegates and certain PO directors helped us to meet the producers by directing us towards inhabitants who were cocoa producers. On some occasions, we took it upon ourselves to ask the inhabitants to direct us towards the cocoa producers who would be most willing to answer our questionnaire.

In total, we interviewed 904 cocoa producers and obtained detailed information concerning 2,487 transactions. Of the 904 producers interviewed, most were men (92%). More than 40% of the producers interviewed were over the age of 50, indicating an ageing of the population of cocoa producers (a fact which has certain consequences on the level of production and the

dynamics of the marketing strategies). Furthermore, more than 60% of cocoa producers have a level of education below secondary school level (cf. table 4).

Table 4: Socio-economic characteristics of the producers interviewed

| Sex of the producer | | Level of education | | Age | |
|---|---|---|---|---|---|
| Female | 8 % | | | 0- 20 | 3% |
| Male | 92 % | No schooling | 7% | 21-35 | 20% |
| | | Primary | 53% | 36-50 | 33% |
| | | Secondary | 36% | 51-65 | 30% |
| | | Higher | 4% | >65 | 14% |

Source: IITA survey 2006

The distribution of the 2,487 transactions according to the type of sales (individual versus collective), the bargaining situation and the province are presented in table 5. As shown on the table, most transactions in our database concern the Centre region. This distribution complies with the number of producers and the production areas (which are higher and larger in the Centre) but not to the volumes (which are larger in the Southwest). Table 5 also demonstrates that the transactions for individual sales are more than those for collective sales.

Table 5: Distribution of transactions per type, bargaining situation and province

| Type of sales | Bargaining situation | Southwest province | Centre province | Total |
|---|---|---|---|---|
| Individual sales | S0 (individual sales at the start of the school year with buyer credit) | 294 | 82 | 376 |
| | S1 (individual sales at the start of the school year without buyer credit) | 13 | 191 | 204 |
| | S2 (individual sales at times other than the start of the school year with buyer credit) | 690 | 158 | 848 |
| | S3 (individual sales at times other than the start of the school year without buyer credit) | 31 | 395 | 426 |
| Collective sales | (Collective sales via a PO at any moment of the marketing campaign) | 0 | 633 | 633 |
| Total | | 1,028 | 1,459 | 2,487 |

Source: IITA survey 2006

The main variables collected (or constructed using the data collected) enable us to characterize the bargaining situation (NEG), the producer's reservation price (PRP), the buyer's reservation price (BRP) and the existence of a possible PO effect. These variables are summarized in table 6. We also introduced certain control variables. These refer to the age and level of education of the producers. Gender was not incorporated in the analysis given the very low percentage of women in the sample. The effect of the level of education is uncertain. The effect of age is unclear. We might imagine that older, more experienced producers obtain better prices. However, they also often become more risk averse over time which can lead to their being less bold in negotiating prices.

Table 6: Description of the variables used in the model

| **Variables** | **Description of the variable** | **Unit** | **Category** | **Expected effect** |
|---|---|---|---|---|
| Pp | Price received by the producer (net of the PO deduction and contributions) | FCFA/kg | Dependent variable | |
| S3 | Bargaining situation during periods other than the start of the school year in which the producer has not received a supplier credit | Binary | NEG | + |
| S2 | Bargaining situation during periods other than the start of the school year in which the producer has received a supplier credit | Binary | NEG | + |
| S1 | Bargaining situation at the start of the school year in which the producer has not received a supplier credit | Binary | NEG | + |
| S0 | Bargaining situation at the start of the school year in which the producer has received a supplier credit | Binary | NEG | 0 (reference situation) |
| RevProd | Total income of the producer | 10,000 FCFA/year | PRP | + |
| IndDivers | Index of the producer's income diversification (the smaller the index, the more the producer is diversified) | between 0 and 1 | PRP | + |
| DistProd | Distance from the house to the point of sale | km | PRP | + |
| NbTransac | Number of transactions per producer during the campaign | | PRP | + |
| Refact | Deduction to take account of an excessive rate of cocoa humidity | Converted into FCFA/kg | PRP | indeterminate |
| InfoP | Information concerning the CIF price (international market price) | =1 if producer informed | PRP | + |
| PCaf | Delayed CIF price (previous fortnight) | FCFA/kg | BRP | + |
| DistBuyer | Number of km between the point of sale and the port of Douala | km | BRP | - |
| DistBuyer2_ | Number of non-tarmac km between the point of sale and the port of Douala | km | BRP | - |
| TypeBuyer | Type of buyer: approved buyer or coxeur | 1= if app. buyer | BRP | + |
| QTransac | Quantity per transaction | kg | PRP; BRP | + |
| HarvestSeason | Season of abundance | 1= if yes | PRP; BRP | indeterminate |
| QTot | Producer's production | kg | PRP; BRP | + |
| NbBuyers | Number of approved buyers in the village (arrondissement) | | PRP; BRP | + |
| Zone | Production region | 1= if Centre | PO effect | + |
| TypeTransac | Type of sales: via a PO versus individual) | 1= if PO | PO effect | + |

## V. Test protocol for the hypotheses

Our different hypotheses can be tested by regressing the price received by the producer (Pp) on the different variables mentioned in table 6.

According to hypothesis H1, for transactions carried out at the start of the school year by a producer who has received a credit from the buyer, the price should be set at the level of the producer's reservation price (the entire surplus generated by the trade being seized by the buyer). This implies that all variables linked exclusively to the buyer's reservation price should have no influence on the price. Inversely, at least some of the variables linked to the producer's reservation price should have a significant (positive) effect on the price received by the producers. In concrete terms, this means taking the sample of the 376 transactions corresponding to bargaining situation S0 (cf. table 5) and the following regression is perfomed:

(1) $Pp = \_0 + \_1\ RevProd + \_2\ IndDivers + \_3\ DistProd + \_4\ NbTransac + \_5\ Refact + \_6\ InfoP + \_7\ PCaf + \_8\ DistBuyer + \_9\ DistBuyer2 + \_10\ TypeBuyer + \_11\ QTransac + \_12\ HarvestSeason + \_13\ QTot + \_14\ nbBuyers + \_15\ Zone + \_16\ Age + \_17\ Educ + \_i$

We consider that H1 is confirmed if $\_7, \_8, \_9$ and $\_10$ are not significantly different from zero and the coefficients $\_1$, $\_2$, $\_3$. $\_4$, $\_5$ and $\_6$ are all positive or zero, with at least one of them being strictly positive.

Hypothesis H2 stipulates that, in the case of individual sales, the price received by the producers should be higher in bargaining situation S1 or S2 than in situation S0 and that it should be even higher in situation S3. The theory does not, however, allow a distinction to be made between situations S1 and S2. We therefore decided to place situations S1 and S2 in a single category called S12. To test hypothesis H2, we take the sample of transactions

corresponding to all individual sales for both provinces and the 4 bargaining situations (cf. table 5) and perform the following regression[10]:

(2) $Pp = \__0 + \__1$ RevProd $+ \__2$ IndDivers $+ \__3$ DistProd $+ \__4$ NbTransac $+ \__5$ Refact $+ \__6$ InfoP $+ \__7$ PCaf $+ \__8$ DistBuyer $+ \__9$ DistBuyer2 $+ \__{10}$ TypeBuyer $+ \__{11}$ QTransac $+ \__{12}$ HarvestSeason $+ \__{13}$ QTot $+ \__{14}$ nbBuyers $+ \__{15}$ Zone $+ \__{16}$ S12 $+ \__{17}$ S3 $+ \__{18}$ Age $+ \__{19}$ Educ $+ \__i$

We consider that H2 is confirmed if $\__{17} > \__{16} > 0$.

According to hypothesis H3, selling via a PO should enable producers in the Centre region to benefit from a higher price (a phenomenon we have called the "direct" PO effect). To confirm H3, the following regression must be performed on the sample of 1,459 transactions made in the Centre province:

(3) $Pp = \__0 + \__1$ PCaf $+ \__2$ DistBuyer $+ \__3$ DistBuyer2 $+ \__4$ TypeBuyer $+ \__5$ HarvestSeason $+ \__6$ nbBuyers $+ \__7$ TypeTransac $+ \__i$

In this regression we have removed all variables concerning the individual producers as these variables can have no effect in the case of collective sales. We consider that H3 is confirmed if $\__7 > 0$. It will also be possible to compare the effect on the PO sale price with that resulting from other factors.

If H3 is confirmed, a structural test can be performed to obtain a more detailed analysis of the channels by which the action of selling via a PO enables producers to obtain a better price. This involves estimating the following equation in which the rX-type variables express the product of the variable X and the binary variable TypeTransac:

[10] Variables S1, S2 and S3 are indeed exogenous: the producers are subjected to the bargaining situation rather than selecting it. By construction, the bargaining situation depends on the action of selling at the start of the school year and on the fact a credit has been received from the buyer. However, these behaviours are imposed on the producers.

(4) $Pp = \__0 + \__1\ PCaf + \__2\ rPCaf + \__3\ DistBuyer + \__4\ rDistBuyer + \__5\ DistBuyer2 + \__6\ rDistBuyer2 + \__7\ TypeBuyer + \__8\ rTypeBuyer + \__9\ HarvestSeason + r\__{10}\ HarvestSeason + \__{11}\ nbBuyers + \__{12}\ rnbBuyers + \__i$

The coefficients $\__2$, $\__4$, $\__6$. $\__8$, $\__{10}$ and $\__{12}$ express the effect of selling via POs on all independent variables included in the analysis. For example, the effect of the variable nbBuyers is captured by the coefficient $\__{11}$ when sales are individual and by the coefficient $\__{11} + \__{12}$ when the producer sells via a PO. $\__{12}$ expresses how the action of selling via a PO alters the effect of the number of buyers (nbBuyers) on the price received by the producer (Pp).

According to hypothesis H4, the mere presence of the POs should alter the way in which the market operates in favour of the producers: producers who sell individually in the Centre region should therefore benefit from a higher price than their counterparts in the Southwest (indirect PO effect). H4 can therefore be tested by taking the same sample and performing the same regression as for hypothesis H2. We consider that H4 is confirmed if the coefficient $\__{14}$ in equation (2) is such that $\__{14} > 0$.

# VI. Results and discussion

The results of the regressions are presented in tables 8, 11, 13 and 14 (in the appendix). Using the "robust" option of the "Stata" software, the t-Student is corrected for the heteroskedasticity of the residuals using White's method. Robustness is tested. The coefficient $R^2$ is relatively low, which is not surprising given the type of data used (cross section of primary data).

With regard to the effect of the bargaining situation on the price received by the producers (hypotheses H1 and H2), the results are as follows.

*Hypothesis H1 is confirmed* by the analyses carried out on the 376 transactions corresponding to situation S0 (transactions undertaken at the start of the school year by a producer who has received a credit from the buyer). None of the coefficients ($\_{7}$, $\_{8}$, $\_{9}$ and $\_{10}$) of the four proxies representing the buyer's reservation price (PCaf, DistBuyer, DistBuyer2 and TypeBuyer) has a significant effect on the price (cf. table 8). However, three of the six proxies for the producer's reservation price are significantly positive ($\_{3}$, $\_{4}$ and $\_{5}$).

*Hypothesis H2 is only partly confirmed by the analysis* (cf. table 11). The regression performed on the 1,854 transactions corresponding to individual sales shows that the most favourable bargaining situation (S3) has indeed a beneficial effect on the price received by the producers ($\_{17}$ is significantly positive). However, the intermediary bargaining situations (S1 and S2) do not enable the producers to obtain a higher price than the reference situation S0).

These results confirm the role of the bargaining situation with regard to the price received by the producers. If the price is non-negotiable and the price-maker (buyer) is well informed about the producer's reservation price, the price is set at the level of the producer's reservation price (the buyer seizes the entire surplus generated by the trade). This theoretical result (hypothesis H1) is (unfortunately) confirmed by the empirical analysis. Putting aside this situation which is unfavourable to the producer (i.e. if the price becomes negotiable *or* if the buyer is no longer informed on the producer's reservation price), the situation does not really improve. *To obtain a significant improvement in the price received by the producer, the distribution of information must become more equitable and the price must be negotiable*. In practice, and for the case of the cocoa market in Cameroon, this means enabling producers to a) do without the credit provided by cocoa buyers and b) be able to wait to sell their cocoa to avoid being obliged to sell at the start of the school year. This requires the development of a credit scheme that improves accessibility of credit to cocoa producers.

The effect of POs on the price received by the producers may be direct (hypothesis H3) or indirect (hypothesis H4). Is this effect confirmed by the analysis?

Hypothesis 3 is confirmed by the analyses carried out on the 1,459 transactions undertaken by the producers in the Centre region. Selling via a PO has a significant and positive effect on the price received by the producer (cf. table 13). *This effect is relatively large*: about 47 FCFA / kg which represents a price increase of about 9%. This result is convergent with that obtained for cereals in Ethiopia: average price increase of 7% when producers market their goods via a cooperative (Bernard et al. 2008). Other factors also play an important role in the Centre region. This is particularly the case of the period of sale: this can result in an additional 10 FCFA per kg of it is favourable (main harvesting period) or 10 FCFA less of it is unfavourable (start of school year). This is also the case of distance from the sea port of Douala where 11 FCFA / kg is loss for every additional 100 km of road.

The structure test that is carried out demonstrates that the PO effect primarily occurs via two channels (cf. table 14). On the one hand, producers who sell via a PO are not subject to the losses linked to the start of the school year. First, unlike producers living in the Centre region who sell their goods individually (they suffer a loss of 15 CFA/kg during this period). Second, and more surprisingly, transactions carried out via the POs are subject to a 10 times smaller deduction relating to the distance to the sea port de Douala (only 2 FCFA/kg for 100 km compared to 22 FCFA/kg for individual sales.

Hypothesis 4 is not confirmed. We tested this hypothesis using the regression performed on the 1,854 transactions corresponding to individual sales (cf. table 11). Although this shows that the binary variable corresponding to the zone has the expected positive effect (higher price in the zone where the POs are present), the effect is nevertheless only significant at 10%

and even then is relatively weak (16 FCFA / kg, i.e. approximately 3% of the average price). In particular, it would be difficult to ascribe the zone's effect exclusively to the presence of POs. The Centre region is not only the region having POs can be observed. It is also a less isolated though zone though further away from Douala. Furthermore, it is a zone where the agro-climatic conditions are less favourable to cocoa farming, a fact which could lead to higher production costs (and ultimately to higher price levels). The existence of an "indirect effect" of POs is not refuted, nor is it proven.

These results therefore confirm the "direct" effect of the POs: the benefit linked to the action of selling cocoa via a PO is real and relatively large (increase of about 9%). The results also demonstrate that the PO effect occurs in part due to a reduction of the transaction costs and in part through an increase in bargaining power. Hence, the fact that the distance from the port of Douala results in a far smaller deduction in the case of sales via POs can probably be explained by cost saving related to the quantities traded (economies of scale). Inversely, the fact that POs are not subject to a deduction when they sell the goods at the start of the school year (unlike individual producers) can probably be explained by their bargaining power. The development and consolidation of POs' capacities would therefore appear to be another means of improving the prices received by the producers. The existence of an "indirect" PO effect was nevertheless not confirmed (or refuted). Today, it is impossible to say if the mere presence of POs in a zone alters the way in which the market works in favour of producers who do not sell their produce via the POs. In light of this doubt, it is preferable to promote both the development of POs and their capacity to obtain their supply from the producers.

## VII. Conclusion

We have shown that the bargaining situation exercises a significant effect on the prices received by cocoa producers in Cameroon. When this situation is at its most unfavourable

side (because the prices are non-negotiable and there is asymmetric information in favour of the traders), the traders seize the entire surplus generated by the trade. To improve the price received by the producers, the price must be made negotiable while at the same time making information less asymmetric. With regard to the cocoa market in Cameroon, this means enabling producers to do without the credits granted by cocoa buyers (as they are bound to the buyer and cannot arbitrate or negotiate the price) and to be able to wait to sell their produce at times other than the start of the school year. Another option involves promoting collective marketing by POs. This helps to improve the bargaining situation, since via Pos, the price is always negotiable and information is distributed symmetrically (sales at the start of the school year are not subject to a deduction). It also enables transaction costs to be minimized (through economies of scale) as well as enable negotiations to be carried out simultaneously with several buyers. Generally speaking, selling via the POs ensures an average price increase of 9%, which corresponds to the increase observed in other countries for other products (Bernard et al. 2008). It is also possible that the mere presence of POs in a zone enables all producers in that zone (even those who sell individually) to benefit from higher prices, although this indirect PO effect could not be confirmed (or refuted).

The main implications for action are as follows. The first option to improve the prices received by the producers involves improving their bargaining situation, which requires a more balanced distribution of information between the producers and the traders combined with negotiable prices. With regard to the cocoa market in Cameroon, the first point requires an improvement in the information available to the producers which could be achieved through the promotion of an efficient market information system. The current system (managed by the ONCC) only provides information concerning the FOB price and not on the prices enforce on the domestic market. A reduction in information asymmetry could also be achieved by the introduction of a producer support policy at the start of the school year (for

example the distribution of vouchers). This would enable producers to avoid selling during this period of the year when the traders are aware of their financial needs. With a view to improve the *price setting rules,* it would prove beneficial to introduce a credit programme (possibly via micro-finance institutions) or a complementary health insurance. This would increase the ability of cocoa producers to manage without credits from the buyers, thereby giving them the possibility to negotiate the price and capitalize on the competition between buyers.

Another option involves promoting the development of collective marketing by POs. Experience has shown that many producers are not members of the POs or only sell a small percentage of their production via these organisations (De Janvry and Sadoulet 2004; Bernard et al. 2008; Bernard et al. 2009a).

These *two categories of intervention may be complementary*. The reason for producers making limited use of POs to sell their produce (whereas this would enable them to obtain a better price) could be linked to the question of credit. We can assume that producers with an urgent need for money cannot sell via a PO because they need access to credit (which is only available through private buyers) or because they cannot wait until the market day organized by the PO to sell their cocoa. The development of a system of credit accessible to the producers (or the implementation of credit systems by the POs) may probably increase the share of supply obtained by the POs. This hypothesis must nevertheless be confirmed.

More generally speaking, the following research perspectives have been opened by this work. First, the *impact of the POs* must be *analysed in greater detail*. This would require the heterogeneous nature of the POs to be taken into account. Various works have indeed shown that the POs are highly diversified and that their commercial performances may vary considerably (De Janvry and Sadoulet 2004; Bernard et al. 2009b). It would also be necessary to test whether or not there is an indirect PO effect on the market structure and on the prices

received by all the producers in the zone in which these organizations are present. The analysis of this indirect effect is all the more important as the POs only obtain a small percentage (sometimes very low) of the producers' supply. The second line of research concerns the *analysis of obstacles to the development of POs*. This would involve analysing the conditions of the emergence of the POs in order to understand why they appear in certain zones and not in others. It would also be useful to identify the factors which cause producers to become members of a PO or not (De Janvry and Sadoulet 2004). Finally, it would be necessary to analyse why producers who are members of a PO choose to sell their produce via the PO or not. Such studies would help to orient policies aimed at facilitating the development of POs and at strengthening their impact on the prices received by the producers.

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# Appendix

**Table 7:** Descriptive statistics for the sample of individual transactions undertaken in bargaining situation S0 (sample used to test H1)

| Variable | Obs | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Price** | **376** | **523.078** | **60.64903** | **350** | **700** |
| **RevProd** | **376** | **69.98774** | **49.53629** | **7.5** | **235** |
| **IndDivers** | **376** | **0.6476781** | **0.260799** | **0** | **1** |
| **DistProd** | **376** | **4.879506** | **17.9356** | **0** | **182** |
| **Nb Transac** | **376** | **4.097552** | **2.041492** | **1** | **12** |
| **Refact** | **376** | **17.31968** | **14.5777** | **0** | **66.66666** |
| **Q Transac** | **376** | **711.7292** | **2212.079** | **5** | **34000** |
| **NbBuyer** | **376** | **2.25** | **1.556492** | **1** | **5** |
| **QTot** | **376** | **2724.485** | **7025.356** | **40** | **102000** |
| **InfoP** | **376** | **0.3218085** | **0.4677925** | **0** | **1** |
| **DistBuyer** | **376** | **262.6596** | **72.0827** | **115** | **378** |
| **DistBuyer2** | **376** | **79.33245** | **69.28491** | **0** | **223** |
| **PCaf** | **376** | **807.6572** | **25.70155** | **780.386** | **842.3239** |
| **TypeBuyer** | **376** | **0.464006** | **0.4889369** | **0** | **1** |
| **Age** | **376** | **47.53541** | **14.20437** | **18** | **110** |
| **Educ** | **376** | **0.8989362** | **0.3018148** | **0** | **1** |
| **Zone** | **376** | **0.2180851** | **0.4134957** | **0** | **1** |

**Table 8**: Result of regression (1): test for hypothesis H1

| **Independent variable** | **Price** |
|---|---|
| **RevProd** | **0.071 (1.04)** |
| **IndDivers** | **-4.039 (0.32)** |
| **DistProd** | **0.193 (2.19)**** |
| **Nb Transac** | **5.939 (3.64)***** |
| **Refact** | **0.398 (2.04)**** |
| **Q Transac** | **0.000 (0.04)** |
| **NbBuyer** | **7.401 (3.09)***** |
| **QTot** | **0.000 (0.03)** |
| **InfoP** | **2.592 (0.43)** |
| **DistBuyer** | **-0.117 (1.32)** |
| **DistBuyer2** | **-0.164 (1.40)** |
| **PCaf** | **-0.182 (1.63)** |
| **TypeBuyer** | **-0.550 (0.08)** |
| **Age** | **-0.221 (0.99)** |
| **Educ** | **0.597 (0.05)** |
| **Zone** | **12.621 (0.76)** |
| **Constant** | **668.798 (7.13)***** |
| **Observations** | **376** |
| **R-squared** | **0.26** |
| Robust t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% | |

**Table 9:** Descriptive statistics for the sample of individual transactions undertaken in the Centre region

| Variable | Obs | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Price** | **826** | **529.6624** | **59.71741** | **300** | **700** |
| **S3** | **826** | **0.4782082** | **0.4998275** | **0** | **1** |
| **S1.2** | **826** | **0.4225182** | **0.4942594** | **0** | **1** |
| **RevProd** | **826** | **47.26667** | **34.92128** | **7.5** | **300** |
| **IndDivers** | **826** | **0.603096** | **0.2904312** | **0** | **2.078027** |
| **DistProd** | **826** | **0.355492** | **2.112453** | **0** | **32** |
| **Nb Transac** | **826** | **2.646403** | **1.046049** | **1** | **6** |
| **Refact** | **826** | **16.76515** | **19.46719** | **0** | **86.74699** |
| **Q Transac** | **826** | **229.1191** | **261.8002** | **5** | **2800** |
| **NbBuyer** | **826** | **3.429782** | **2.64287** | **1** | **10** |
| **HarvestSeason** | **826** | **0.5726392** | **0.4949951** | **0** | **1** |
| **QTot** | **826** | **650.1874** | **803.0162** | **40** | **6320** |
| **InfoP** | **826** | **0.3801453** | **0.4857164** | **0** | **1** |
| **DistBuyer** | **826** | **342.0266** | **53.41562** | **115** | **450** |
| **DistBuyer2** | **826** | **21.55448** | **32.92287** | **0** | **90** |
| **PCaf** | **826** | **805.0628** | **25.29682** | **766.0897** | **950.8137** |
| **TypeBuyer** | **826** | **0.094431** | **0.2926046** | **0** | **1** |
| **Age** | **826** | **51.35241** | **14.67262** | **19** | **100** |
| **Educ** | **826** | **0.933414** | **0.2494546** | **0** | **1** |

**Table 10:** Descriptive statistics for the sample of individual transactions undertaken in the Southwest region

| Variable | Obs | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Price** | **1028** | **527.5747** | **65.13925** | **350** | **700** |
| **S3** | **1028** | **0.0301556** | **0.1710987** | **0** | **1** |
| **S1.2** | **1028** | **0.6838521** | **0.4651977** | **0** | **1** |
| **RevProd** | **1028** | **75.12977** | **50.75766** | **7.5** | **235** |
| **IndDivers** | **1028** | **0.6535128** | **0.2631244** | **0** | **1** |
| **DistProd** | **1028** | **4.701988** | **15.20285** | **0** | **182** |
| **Nb Transac** | **1028** | **4.679563** | **2.168532** | **1** | **12** |
| **Refact** | **1028** | **17.14272** | **13.70691** | **0** | **65.625** |
| **Q Transac** | **1028** | **675.2192** | **2601.895** | **10** | **68000** |
| **NbBuyer** | **1028** | **2.114786** | **1.450399** | **1** | **4** |
| **HarvestSeason** | **1028** | **0.4776265** | **0.4997423** | **0** | **1** |
| **QTot** | **1028** | **3376.623** | **7372.158** | **55** | **102000** |
| **InfoP** | **1028** | **0.3317121** | **0.4710573** | **0** | **1** |
| **DistBuyer** | **1028** | **241.5506** | **68.64414** | **144** | **367** |
| **DistBuyer2** | **1028** | **95.36965** | **66.21469** | **0** | **223** |
| **PCaf** | **1028** | **807.9296** | **32.43611** | **766.0897** | **950.8137** |
| **TypeBuyer** | **1028** | **0.5916399** | **0.4684961** | **0** | **1** |
| **Age** | **1028** | **46.26057** | **14.42335** | **16** | **110** |
| **Educ** | **1028** | **0.8891051** | **0.3141548** | **0** | **1** |

**Table 11:** Result of regression (2): test for hypotheses H2 and H4

| Independent variable | Price |
|---|---|
| **S3** | **21.270 (4.07)*** ** |
| **S1.2** | **6.181 (1.60)** |
| **RevProd** | **0.095 (2.93)*** ** |
| **IndDivers** | **8.149 (1.67)*** |
| **DistProd** | **0.108 (1.65)*** |
| **Nb Transac** | **2.730 (3.56)*** ** |
| **Refact** | **0.047 (0.58)** |
| **Q Transac** | **-0.001 (1.52)** |
| **NbBuyer** | **4.857 (6.22)*** ** |
| **HarvestSeason** | **5.442 (1.60)** |
| **QTot** | **0.001 (3.13)*** ** |
| **InfoP** | **-4.648 (1.60)** |
| **DistBuyer** | **-0.192 (4.11)*** ** |
| **DistBuyer2** | **-0.125 (2.12)** ** |
| **PCaf** | **-0.046 (1.02)** |
| **TypeBuyer** | **10.490 (3.01)*** ** |
| **Age** | **-0.395 (3.91)*** ** |
| **Educ** | **0.152 (0.03)** |
| **Zone** | **15.967 (1.80)*** |
| **Constant** | **589.575 (15.14)*** ** |
| **Observations** | **1854** |
| **R-squared** | **0.19** |
| Robust t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% | |

**Table 12:** Descriptive statistics for the sample of collective transactions undertaken in the Centre region

| Variable | Obs | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Prix** | **633** | **593.2242** | **61.07331** | **350** | **750** |
| **rentr_escol** | **633** | **0.2985782** | **0.4579963** | **0** | **1** |
| **NbBuyer** | **633** | **6.723539** | **3.723561** | **1** | **10** |
| **HarvestSeason** | **633** | **0.5418641** | **0.4986383** | **0** | **1** |
| **DistBuyer** | **633** | **385.3476** | **64.7927** | **161** | **450** |
| **DistBuyer2** | **633** | **18.33333** | **26.91497** | **0** | **90** |
| **PCaf_1** | **633** | **805.1705** | **24.67323** | **766.0897** | **950.8137** |

**Table 13:** Result of regression (3): test for hypothesis H3

| Independent variable | Price |
|---|---|
| **rentr_escol** | **-10.966 (2.77)*** ** |
| **NbBuyer** | **6.383 (9.08)*** ** |
| **HarvestSeason** | **9.867 (2.37)** ** |
| **DistBuyer** | **-0.107 (2.82)*** ** |
| **DistBuyer2** | **-0.045 (0.73)** |
| **PCaf_1** | **-0.086 (1.45)** |
| **typvent_1** | **46.972 (13.87)*** ** |
| **Constant** | **612.299 (12.63)*** ** |
| **Observations** | **1459** |
| **R-squared** | **0.29** |
| Robust t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% | |

**Table 14:** Result of regression (4): structure test for more detailed hypothesis H3

| Independent variable | Price |
|---|---|
| **rentr_escol** | **-15.021 (3.75)*** ** |
| **rrentr_escol** | **17.458 (2.31)** ** |
| **NbBuyer** | **5.879 (8.24)*** ** |
| **rNbBuyer** | **-0.265 (5.00)*** ** |
| **HarvestSeason** | **8.350 (1.70)*** |
| **rHarvestSeason** | **4.249 (0.71)** |
| **DistBuyer** | **-0.216 (5.48)*** ** |
| **rDistBuyer** | **0.195 (7.79)*** ** |
| **DistBuyer2** | **0.048 (0.77)** |
| **rDistBuyer2** | **-0.127 (0.94)** |
| **PCaf_1** | **-0.063 (1.07)** |
| **rPCaf_1** | **0.045 (0.38)** |
| **Constant** | **633.478 (12.95)*** ** |
| **Observations** | **1459** |
| **R-squared** | **0.32** |
| Robust t statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% | |