Market Power and Structural Adjustment

The Case of West African Cocoa Market Liberalization

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Abstract

Liberalization of the cocoa market in West Africa, due to structural adjustment reforms, has resulted in the elimination of para-statal marketing boards and initiated the creation of new institutions to replace the marketing services of those agencies. Concerns have been raised as to the effects of these reforms on prices of cocoa received by farmers, welfare measures and competitiveness of marketing channels. Of particular importance is backward integration of multinational processing firms, who take over exporting activities and may collect rents previously captured as export taxes. This paper uses a conjectural variations approach to estimate the degree of market power present in the post-liberalized cocoa bean markets of Ivory Coast and Nigeria. Evidence of market power is found in the Ivory Coast markets between the farmgate and U.S./EU15 imports. The market power, exercised by multinational exporter/processors, must be considered in concert with the Ivorian government who is still collecting export taxes. In contrast, no evidence of market power is found in the Nigerian markets or domestic (farmer to trader) markets of Ivory Coast.

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Introduction

Historically, the incomes of West African smallholder cocoa farmers were determined by state-controlled entities. These para-statal marketing agencies set prices and marketing margins, and intervened in input markets, procurement of cocoa and subsequent export. Mandated farmgate prices aimed to protect the farmers from world price volatility while the taxes levied on cocoa exports were an important source of foreign exchange and government revenue. Recent liberalization of these markets, due to structural adjustment reforms, has resulted in the elimination of para-statals and created the need for new private institutions and market agents to replace the services of those government agencies (Bloomfield and Lass, 1992; Varangis and Schreiber, 2001). Initially, chaotic markets characterized by entry of many exporters emerged (Gilbert, 1997), but recently multinational cocoa bean processors took over exporting as well as processing and are backward integrating into domestic links of the cocoa supply chain.

The main objective of cocoa market liberalization in West Africa was to ensure greater 'pass-though' of the world price to the farmer and to tie the dynamics of the entire chain to world market forces in an effort to improve efficiency (Gilbert and Varangis, 2003). However, if imperfectly competitive agents with market power replace para-statals this may widen the previously large gap between the farmgate price and the price received for exported beans in EU15 and the United States, as agents in a long supply chain reap rents that previously accrued to the government as taxes. This has arguably left farmers at the mercy of both the unstable world market and concentrated multinational corporations, leading to concerns as to the effects of structural adjustment reforms (Gilbert, 1997; McIntire and Varangis, 1999; Gilbert and Varangis, 2003; Dorin, 2003).

Nigeria and Ivory Coast provide an interesting juxtaposition. As the earliest (1986) and most recent (1999) cocoa market liberalizers, respectively, they provide an opportunity to examine market power issues as they evolve over time. Institutional differences across these countries suggest the possibility of very different outcomes. The purpose of this paper is to estimate the degree of oligopsony power that may exist in post-liberalized Ivory Coast and Nigeria at various points along the cocoa supply chain.

The paper is organized as follows. Section I provides background related to cocoa market structure. Section II examines literature regarding structural adjustment as it pertains to cocoa market liberalization, emphasizing the role of backward integrating multinationals. Section III describes the theoretical approach adopted in this study. Section IV describes the model and data used in econometric estimations. Results are explained in Section V and concluding remarks are provided in Section VI.

I. *Background on cocoa market structure*

Cocoa beans are a perennial tree crop grown in tropical climates, with over 66% produced by smallholder farmers in West Africa (ICCO, 2003). Ivory Coast leads all countries with approximately 35 percent of total world production while Ghana, Nigeria and Cameroon accounted for 13%, 12% and 4%, respectively. Cocoa plays an important role in these African economies as a main export good and source of foreign exchange. In addition, smallholder farmers (< 5 hectares) typically grow this cocoa, which generates work opportunities for an estimated 10.5 million Africans (ICCO, 2003). The beans are fermented and dried in their country of origin. Though some producing countries have begun to process their own beans, the bulk of production is shipped to processors in Europe and North America who roast beans and

grind them into liquor. Liquor can be used directly in the manufacture of chocolate or is further processed, through pressing, into butter and powder. The vast majority of finished products that contain cocoa are consumed in Europe and North America.

In the past, producers from the main cocoa producing African countries participated in a system where para-statals controlled farmgate prices, input supply and all levels of marketing, research and extension (Dand, 1999; Fold, 2002). The French and English influences from their colonial past led each country to follow either a *Caisse de Stabilisation* or marketing board approach, respectively. The marketing boards in Ghana and Nigeria controlled all aspects of the cocoa marketing chain by setting the f.o.b. price in the preseason, and by declaring producer prices, buyer's margins, transportation costs and export taxes. The marketing boards also performed all the related tasks including inspections, buying, loading, transportation, quality control, storage and export. The *Caisse*, in Ivory Coast and Cameroon, on the other hand, was not directly involved with the transportation of cocoa from the farmgate (controlled by private traders called *traitants*) and permitted 'private' exporters to operate within a system of quotas (Losch, 2002), and regulated farm gate as well as export prices, while collecting substantial taxes.

Nigeria was the first West African cocoa producer to liberalize (in 1986), with reforms from the producer and input level through the marketing chain to exporting the beans. Currently, Ghana is the last country to retain its marketing board and other portions of its para-statal apparatus, having undergone partial reforms beginning in the 1992/93 season, while Cameroon and Ivory Coast began the liberalization process in 1991 and 1999, respectively (ICCO, 2003). 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.

Cameroon has eliminated export taxes and promoted 'cooperation' between Cameroonian exporters and multinational firms. Ivory Coast has restructured its taxation regime, eliminated the *Caisse de Stabilisation*, and allowed some backward integration by the market's new entrants – the multinational firms. Ghana has allowed the creation of quasi-private exporting firms but the marketing board structure remains largely intact. Less is known about Nigeria, the first to liberalize, but there are reports that it has the most competitive cocoa sector since many local exporters are still warehousing and exporting independent of the multinationals that are also present (Dand, 1999).

The use of market power has a long history in cocoa markets, as quotas as well as implicit and explicit tax schemes have been implemented by para-statals (Panagariya and Schiff, 1992). The export tax intervenes between the producer and world price and may be set 'optimally' as governments take advantage of their nation's relatively large world market share. The optimal tax is a function of interactions among and conjectures about the other major producing countries in addition to residual demand and supply elasticities (Yilmaz, 1999). The tax wedge generates revenue to the government which is theoretically redistributed to the population. A goal of structural adjustment has been elimination of these taxes due in part to inefficiencies and corruption in redistribution.

The current structure of the marketing chain in Ivory Coast is diagramed in Figure 1 (adapted from Sanogo, 2002). Markets in other West African countries exhibit small variations. As shown, it provides the cocoa farmer with two basic options: sell their product to pisteurs (up-country agents) and so traitants or to cooperatives. According to the Bureau d'Etudes Techniques et de Dévelopement (BNETD), the market share enjoyed by cooperatives has decreased from 32% during the 1998/99 season to 18% in the post-liberalization season of 2000/01 leaving

almost 80% to be funneled through middlemen (BNTED, 2002). Once the cocoa arrives at the port of Abidjan or San Pedro, it is conditioned for export (*usinage*) and shipped to processors largely by multinational exporters who, in the cases of Archers Daniels Midland (ADM), Cargill and Barry Callebaut, are themselves processors. Therefore the farmgate price is now the residual of the 'c.i.f.' (EU15/ U.S.) price less transportation, conditioning, taxes and other associated marketing costs which may include rents to exporters. This is in contrast with pre-liberalization where the farmgate price was mandated and rents were collected exclusively by the government.

A survey of reports shows how multinational exporter market share has evolved since liberalization in Ivory Coast (Table 1). Immediately after liberalization was implemented in Ivory Coast, the nation's largest exporter/processor was Sifca-Jag with almost a 20% market share while at the same time ADM had put a partial takeover of Sifca into motion. Overall, fourteen firms controlled three-quarters of the cocoa that was declared for export in 99/00 (the cocoa season traditionally begins in October and some data include bean equivalents as several exporters process a small portion of Ivorian output in-country). These fourteen firms now control upwards of 85% of the export market, with almost 90% during the 2001/02 season. Currently, though there are 61 exporters, the top five firms control roughly half of the total exports. According to the calculated Herfindahl-Hirschman index (Table 1), the equivalent number of symmetric firms ranges from 10.9 in 2000 to 13.8 in 2003.

Unfortunately, these reports only allow one to discern the nominal ownership of cocoa exporters while anecdotal information leads us to believe that several smaller companies are acting on behalf of the larger exporters, and there are allegations of overlapping ownership. Moreover, the project funding this research (STCP) has worked with cooperatives who are developing partnerships with the multinational exporter/processors, including cooperatives who

are acting as their own exports, but contract for services (usinage, transportation, warehousing, port handling) from the multinational exporters. This practice allows the multinationals to realize economies of scale beyond what is possible under regulations limiting the market share of exporters, while the cooperatives also bear the price risk of these export transactions.

II. *Research Specific to Market Power and Cocoa Market Liberalization*

Fold (2002) and Losch (2002) both provide insight into how the market structure of West African cocoa (Ghana and Ivory Coast, respectively) has changed and may further change due to liberalization. Both authors provide anecdotal evidence supporting the possibility that liberalization resulted in backward integration by the multinational grinders and subsequent market power exertion.

Currently, the consolidation of exporters across countries is to the point where, cumulatively, multinationals have cocoa bean market shares that almost rival Ivory Coast itself (Fold, 2002 and Losch, 2002). The 'oligopolistic' countries have been replaced by a few multinationals that may be better prepared to use their market power, to achieve different objectives. In the past, major cocoa producers with aims of exercising market power (i.e. Ivory Coast) were thwarted by non-cooperation and limited by in-country storage capacity due to climatic conditions. Coordinated international efforts have also been attempted in the form of four separate international commodity agreements in an effort to stabilize market prices, but these quotas or stock schemes all failed (Maizels, 1997). In contrast, as the multinational processors backward integrated, they have also made efforts to integrate forward as the primary chocolate manufacturers were restructuring and willingly sold their processing capacity to the processors. Some processors are also entering the chocolate manufacturing business. The take

home message is that liberalization opened up the export market to private multinational corporations that have incentives to vertically integrate in an effort to promote cost savings through efficiency gains and possibly to exert market power against smallholder farmers, chocolate manufacturers, and consumers.

Gilbert (1997) examines the possible effects of liberalization on farmgate prices and the resulting farm income. While exchange rate and inflation issues may dampen the usefulness of cross-country comparisons, liberalized markets (at the time Nigeria and Cameroon) resulted in farmers receiving a larger share of the f.o.b. price. Gilbert notes that export taxes may lower after liberalization but are not necessarily eliminated. And the narrower margins could also reflect greater competition along the supply chain.

Gilbert and Varangis (2003) discuss how liberalization opens the marketing chain to world price volatility and that export taxes will have less of an impact on farmgate prices. This, coupled with the market share enjoyed by countries like Ivory Coast and Ghana, may result in supply shifts that have large country implications on price: lower prices as output expands, so farmers will have a larger share of the lower price. The origin of this result was the 'adding up' effect, due to inelastic world demand and elastic farmer supply. The authors contend that producers will see some welfare gain if export tax revenue is redistributed and that foreign consumers of cocoa products will be the only 'clear winners' as the world price of cocoa falls.

McIntire and Varangis (1999) analyze the reforms undertaken by Ivory Coast early in the liberalization process. Ivory Coast's pricing policies and marketing strategies were examined in a general equilibrium framework. They concluded that the government did not manage farm price stabilization programs effectively under the *caisse* system and that under the new liberalization scheme farm prices should rise, along with rural incomes, by lowering the export tax. They

found that lowering the export tax would have a slight negative effect on national income, but trying to raise the tax to 'optimal' levels may have deleterious effects on Ivory Coast's market share. Improving the efficiency of the marketing chain through competition and raising the minimum producer price (which had since been eliminated and then reinstituted ineffectively in 2003) should also promote income gains.

Dorin (2003) took a value sharing approach to establish how the current move toward liberalization in Ivory Coast has changed the environment in which the producers, governments, processors and manufacturers operate. He notes that export taxes have fluctuated from a pre-liberalization level of 36% of the c.i.f. price in 1996/97 to 19% in 1998/99 and now rest between 25 and 29%. Looking at data from 1992 to 2001 covering all levels of value from farmgate to French chocolate tablet, he concludes that the gains and losses imply bilateral market power exertion by multinational processors.

The common thread has been the increased importance of multinational firms. Fold (2002), Losch (2002) and Dorin (2003) discuss market power within the newly liberalized markets, focusing on the new role of multinationals. Their insights provide a basis upon which we use economic theory and data to uncover evidence, if any, of the exertion of market power in the marketing chain from farm-level cocoa procurement to the exporter selling the beans. The major drawback to this literature is the lack of attention paid to measuring the extent of market power in the cocoa marketing chain, and its quantitative effects on market outcomes. And none of these studies takes into consideration the fact that the marketing chain itself may completely alter the outcomes and policy prescriptions of their models due to the presence of market power in both domestic and international links.

This paper attempts to resolve this issue on the extent of market power exercised by multinational cocoa exporter/processors after liberalization. New Empirical Industrial Organization type estimations will explicitly test for market power and estimate markup/downs due to those rents.

III. *Estimation of Market Power*

Market power issues in the agricultural sector have received increasing attention as firms in the United States and European Union consolidate throughout the marketing chain (Sexton and Zhang, 2001; McCorriston, 2002). While consolidation itself does not automatically predestine a sector to imperfect competition, it is an often cited characteristic that may increase the incidence of market power within the Structure-Conduct-Performance (SCP) paradigm (Carlton and Perloff, 1994). The demand and supply dimensions of agricultural goods also may lead to imperfect competition. For example, the nature of raw agricultural products (bulky, perishable, limited substitutability, etc.) and their production (economies of scale, exit barriers, etc.) creates opportunities for firms to exert market power on the demand and supply side, respectively (Sexton and Zhang, 2001). Imperfect competition in the trade of agricultural goods is driven by factors such as increasing returns, intra-firm trade and market structure (Helpman and Krugman, 1985).

The vast majority of work in the field of market power and the agricultural sector has focused on estimating the degree of market power in processing, manufacturing and retail (Sexton and Lavoie, 2001). An early contribution by Appelbaum (1982) looks beyond the SCP paradigm and introduces a model framework that builds on the New Empirical Industrial Organization (NEIO) paradigm. NEIO relies on game theory and econometrics to find evidence

of market power by using price and quantity data for individual industries (Sexton, 2000; Carlton and Perloff, 1994). Much of this work has been done using a conjectural variations approach that incorporates a firm's belief about how rivals will react to their output choice within a static framework. That approach, as proposed by Appelbaum (1982) for the monopoly case, will be modified here to accommodate the oligopsony case following Schroeter (1988) and to examine intermediaries.

IV. Description of the Model

As described previously, the generic cocoa marketing chain consists of agents that facilitate the movement of cocoa from the growing areas to the ports where the beans are conditioned and shipped. Farmers in each country are assumed to produce homogenous products. These producers are assumed to behave as competitive agents who simply satisfy demand at prices which they take as given. Agents demanding cocoa beans from the farmer will be either be traitants, who earn the prevailing prix entrée usine (price received prior to conditioning by traitants) less fixed marginal costs and the farmgate price, or exporters who receive the c.i.f. price (unit import value) less export taxes, fixed marginal costs and the farmgate price. Potential agents who could exercise market power are the government via continued export taxes, exporters/processors, and even the local traitants. These are intermediaries along a chain who buy from farmers (or traitants in one variant) and sell to processors in Europe and North America. Our basic model, modified to treat each potential agent, describes the behavior of an intermediary with potential market power both up and down stream. An exporter is typical, and the agent most likely to exercise market power.

Theory

An exporting firm j's problem is to choose the profit (Π) maximizing amount of cocoa beans q_{ij} in month *i* to buy/sell given farmer supply, processor/chocolate manufacturer demand, and conjectured responses by rival firms:

$$\underset{q_{ij}}{\text{Max}} \prod_{ij} = P_i(Q_i)q_{ij} - r_i(Q_i)q_{ij} - cq_{ij} \qquad (1)$$

where P_i is the nominal price at which the beans are sold by firm *j* in month *i* and r_i is the farmgate price for beans in month *i* - both are functions of overall aggregate demand by the exporting sector (Q). The last term, *c*, represents the fixed marginal cost associated with cocoa bean procurement by the exporting firm. These costs may include: conditioning at the port, transportation from farm to port or port to port as well as other costs of doing business such as non-export tax fees to the government. The first order conditions for profit maximization are:

$$\left[\frac{\partial P_i}{\partial Q_i}\frac{\partial Q_i}{\partial q_{ij}}q_{ij}\right] + P_i - \left[\frac{\partial r_i}{\partial Q_i}\frac{\partial Q_i}{\partial q_{ij}}q_{ij}\right] - r_i - c = 0 \qquad (2)$$

where $\partial Q_i/\partial q_{ij}$ is the effect of this firm's behavior on industry quantity, Q, based on the conjecture on rival behavior. This can be re-arranged into elasticity form as an aggregate optimality condition:

$$P_i\left[1+\frac{\Theta}{\eta n_k}\right] = r_i\left[1+\frac{\Theta}{\varepsilon n_k}\right] + c \qquad (3)$$

where Θ represents the industry level conjectural elasticity, η the own price elasticity of demand, ε the own price elasticity of supply and n_k is the equivalent number of symmetric firms in a given season *k*, based on the Herfindahl-Hirschman index calculated from export declarations data (Table 1).

As with many other NEIO studies, firm level data is not available so industry level data is used here. Appelbaum considered θ^j to be a benchmark estimate of the oligopolisitic power of firm j. This could be used to test the hypotheses that $\theta^j = 0$, the behavior of the firm (which is an oligopoly by assumption) is described by perfect competition, or $\theta^j = 1$ where the firm behavior is characterized by pure monopoly. Schroeter extends this definition to describe behavior in the factor markets as well and observes that θ^j is the j^{th} firm's perceived rate of change (as an elasticity) of aggregate market output (factor demands) with respect to the firm's output (factor demands) in the monopoly (monopsony) case. In order to implement their theoretical framework at the industry level, these views of θ^j required that marginal cost ($c_j = c$) was constant and shared common values across symmetric firms, and therefore $\theta^j = \Theta$. In other words, all of the firms would act with the same degree of market power, so $\partial Q_i / \partial q_{ij} = \Theta$ for all j. This assumption on Schroeter's intermediary case also implied that the firm's behavior was the same in both the output and factor markets (as implemented above, a result of Leontief cost function restrictions used to resolve indeterminacy of upstream versus downstream behavior). While this assumption is appropriate given the prevailing technology and available data, this limits our ability to attribute any evidence of profit taking to the exporter/processor's relative ability to markup the price against agents upstream versus markdown prices received by farmers or traders depending on which input price is considered. In our case, this could be resolved if we had greater confidence in the constant elasticity assumption used to derive (3) and the specific elasticities we needed to assume (η and ε).

Both authors use the estimated Θ to calculate price distortions in the output (and input in Schroeter's case) market as measured by Lerner's index (and its factor market analog). In contrast to Appelbaum and Schroeter, markup/down is quantified here by subtracting off all costs

incurred by the firm (taxes, and estimated fixed marginal (c) and input costs) leaving the residual rent. A percent markup/down is then measured as rent relative to the output price average from the sample.

For the purposes of both theoretical derivation and estimation in this paper, cocoa beans are assumed purchased by the exporting firm and sold exclusively in the EU15 and the United States. Consumption in the producing country is considered negligible as is any processing of the beans.

Cocoa beans are a perishable crop that requires handling that is beyond the typical smallholder's capability. Cocoa is usually marketed within a month after on-farm harvest and conditioning (drying and fermentation). Cocoa is also a seasonal crop that is harvested in the greatest amounts between October and March (the main crop) and to a lesser extent during April through June (the mid-crop). Cocoa is observed on the world market during the months of July through September, but this is usually from stores held by traders and processors, not farmers. Since transactions along the making chain can take several weeks to complete, due to transportation and conditioning tasks, the input price in the current and lagged period are weighted in the optimality condition and these econometrically estimated weights sum to one. This accounts for delivery lags and possible short term storage by traders and exporters in the empirical implementation of the model.

The optimality condition (3) includes three unknown parameters, Θ, η, and ε which cannot be identified from linear estimation of that equation. Estimates of the necessary short run elasticities could be obtained from the literature or from demand and supply functions that are estimated simultaneously with the optimality condition. The former approach was chosen, so we estimate only Θ from the single optimality condition for Ivory Coast and Nigeria given η and ε.

As a perennial tree crop, estimating a cocoa supply function should take into consideration farmer's tree planting decisions, the delayed maturation of the tree (most types do not bear fruit for up to 3 -5 years), and the farmer's management strategies based on their expectations for the present and future seasons. The original work on cocoa supply response in Ghana was done by Bateman (1965). Bateman based aggregate supply response on an iterative model that incorporated the choice of the Ghanaian farmers to plant cocoa (a perennial tree crop) and the ensuing management. Since his 'technological capacity' approach was introduced, several researchers have attempted to improve on its basic design and implementation by adding lagged dependent and independent variables, introduction of competing crops to capture the dynamic effects of competing uses of labor, planting decisions and an examination of longer term elasticities (see Akiyama and Trivedi, 1987 for a review). A common thread in these studies is the use of annual data that is often problematic due to lack of confidence in its compilation.

In this study we attempted to use both annual and available monthly, post-liberalization data to estimate the necessary short run supply elasticity ε. All attempts were met with failure, reflecting strong upwards trends in supply in Ivory Coast in the face of declining world and farmgate cocoa prices. Lack of appropriate monthly data precluded us from trying the same estimation of the short run, own-price elasticity of demand, η. Therefore, we set the short run supply elasticity ε as 0.2, as a consensus result from available recent prior estimates (Gilbert and Varangis, 2003; Labys, 1973), and set η at -0.3 based on ICCO estimates of the short run demand for chocolate (ICCO, 2004). Since we are estimating a monthly model we erred on the low side in choosing these parameters, reflecting what we believe are limited very short run alternatives available to farmers, traders and even exporters. Sensitivity analysis, by varying

these elasticities, generated proportional changes in estimates of Θ without changing results or significance on tests of market power.

Data

The econometric approach to the estimation of market power is often data intensive and data limitation issues can be a problem. Data were collected from a variety of sources. All analyses for Ivory Coast covered monthly data from October 1999 to February 2003 with data from July through September omitted due to lack of information (these months represent transactions that are comprised of primarily beans stored by the traders and/or exporters so this should not significantly affect the results concerning the farmer's direct interactions with the agents upstream). Nigerian data was available on a monthly basis from January 1997 to June 2002. All months were included in the Nigerian data set. Import unit values were used to represent the price received by the exporter. These were calculated by summing the quantity (in metric tons) and value (in nominal US$) of exports to the EU and US and dividing quantity by value for that month. These unit values are taken to represent the price at which the exporting firm can sell their beans in the overseas markets. This c.i.f. price includes the export tax levied on exporters by the government of Ivory Coast. Therefore, a time series of export taxes (DUS) was collected from the Observatoire (BNETD, various years) and *Factiva* and subtracted from the unit values in instances where the aim was to determine whether the Ivory Coast government's actions were actually influencing the results on exporter behavior.

Farmgate prices for 1997 to June 2002 in Nigeria are reported as monthly averages by the Foreign Agricultural Service of the United States Department of Agriculture (US-FAS, 2004) through the US Embassy in semi-annual Attaché Reports. Farmgate price and prix entrée usine

data for Ivory Coast from October 1999 to June 2001 were obtained from the BNTED (various years). The remaining prices, from October 2001 to June 2003 were monthly averages calculated from weekly observations through Factiva (*Dow Jones Commodity Wire* or *Reuters*). Ivory Coast reports weekly farmer prices from up to 6 different buying stations so an average price, weighted by annual production in each area, was used. For use in the estimation of market power against farmers by traders, the prices were left in local currency per metric ton. When used in the optimality condition, the farmgate price was converted to US$/mt using monthly exchange conversion rates from *DataStream*.

Figures 2 and 3 present data used in regressions to test for market power in Ivory Coast and Nigeria. For world prices, they include import unit values as well as the ICCO price, an average of NYBOT and LIFFE commodity exchange prices. These data show that unit values are a good approximation of world cocoa prices and that farmgate and trader prices follow with similar patterns but exhibit a substantial margin which could be attributed to market power.

V: *Regression Results*

Ivory Coast

Five separate regressions were performed for Ivory Coast. The optimality condition (3) was used to examine transactions between farmers and exporters as well as between traders and exporters, both with and without the export tax wedge imposed by the government (Table 2). The final regression examined the interaction between farmers and traitants (traders). In each case an intermediary with potential market power faced differing upstream and downstream prices, so supply and demand functions.

Wald tests were performed to test the hypothesis that the conjectural elasticity, Θ, was equal to zero, at a 1% significance level. In other words, the Wald test provides evidence on whether the conjectural elasticity truly represents perfect competition or a departure manifested as oligopoly/oligopsony power exerted by the intermediary in the marketing chain.

The first cases examine whether a combination of the government and exporters exert market power. An initial perspective of this case would be that export taxes are simply an exogenous cost of doing business to multinationals, so implicitly in *c*. In each case perfect competition is rejected, and markups/downs range from 36.5% to 24.6%, depending on whether farmgate or trader prices are used, and whether delivery lags are considered. These results are consistent with a reluctant sharing of market power between the government, who continues to tax exports, and the multinationals. Subsequent results suggest the government still sees and seeks to exploit market power, but that it is now shared with the multinationals. News reports on "debate between the government and trader organizations" as export taxes are adjusted when world market prices change are consistent with this view of bilateral market power.

The next case considers a multinational intermediary only, by eliminating export taxes from the c.i.f. prices received by exporters, to determine if exporters exercise market power once the influence of government is removed. In two of those three cases significant market power is found. Markups/downs range from 20% to 8.9%. The smallest markup and insignificance on market power is found when trader rather than farmer prices are used, and when delivery lags are not considered. This last specification was tried because the period weights were not significant in the regression applying delivery lags. This result is ambiguous, but strongly suggestive of market power in the hands of exporters. It may reflect some sharing of rents with traders (a likely outcome given institutional arrangements permitting collusion via partnerships between

exporters and some large traders as well as cooperatives). That these markups are less than those found when the government is included indicate that some degree of market power remains in the hands of government as they adjust export taxes.

Though anecdotal reports have claimed that traitants exert market power on farmers, this effect is not captured when one considers the farmgate to trader margin. It appears that there may be a slight markdown against farmers of 1.1%. However, exertion of market power is not suggested by the conjectural elasticity, which is not significantly different from zero. Another explanation may be that it is pisteurs who exert market power over remote, isolated farmers, and that market power does not show up in these farmgate prices measured at buying centers.

Nigeria

Regression results for Nigeria were inconclusive as the conjectural elasticity was estimated to be a theoretically impossible -0.0223 and yet significant at the 5% level. Upon further examination, the source of this confounding result is evident in the data. Farmgate prices, converted to thousands of US$ per metric ton at official exchange rates are higher than the prevailing export price for several monthly observations, including rather long continuous periods. Several authors have noted that this is likely the result of exporters using cocoa as a source of foreign exchange in a country where inflation has been considerable and whose currency suffers from convertibility issues and is likely substantially overvalued (Gilbert, 1997; Dand, 1999; Varangis and Schreiber, 2001). Thus, exporters may be able to convert currency on a black market for foreign exchange to cover these apparent losses. We are searching for black market exchange rates for Nigeria to get a better handle on this issue.

Anecdotal information, in the form of news reports, indicates that the Nigerian export market is relatively competitive and multinationals have not grown a foothold in this market (as compared to Ivory Coast). Reported farmgate prices follow closely world prices, and are much closer in level to those prices. Recent reports of farmers hoarding cocoa for short period of time and banding together to refute advertised farmgate prices together with these results indicate that liberalization may not have wrought market power. But the foreign exchange constraints may confound this interpretation, and lead to a different conclusion about the success of reforms in this market.

VI: *Concluding Remarks*

These results strongly suggest that there is exercise of market power along the cocoa supply chain in Ivory Coast. It appears that the government continues to extract rents from its large world market share, but following liberalization those rents are shared with multinational exporters. The markups that include export taxes range from 30 to 36%. These are ominously similar to optimal export taxes estimated by Yilmaz and more importantly to actual export taxes charged by the Ivory Coast government prior to structural reforms. While the results which seek to isolate market power of the multinational exporters are strongly suggestive that market power is exerted, how that is shared between the government and local traders is uncertain, and needs further sorting out. There is little evidence of local traders exercising market power against farmers, although they may be colluding with exporters in some instances, and market power against remote farmers would not be found in this data.

Results for Nigeria are consistent with perfect competition among intermediaries there. But foreign exchange issues suggest that future work is needed on the role of black markets for

foreign exchange, and the cost of an overvalued currency to farmers. Traders in Nigeria may be primarily in the foreign exchange business, with cocoa as a side enterprise to generate foreign exchange.

The exercise of market power, whether directly against farmers or upstream by exporters, increases the margin between farmgate prices and prices paid by consumers and chocolate manufacturers. Farm income would be higher if these markets were more competitive. Changes in institutional structures are needed to bring greater pass-through of chocolate prices to farmers. Institutional innovations of antiquated supply chain links may also reduce transactions costs currently contributing to low farm income.

Further research should be conducted where the optimality condition is specified in such a way that the conjectural elasticity can vary depending on month or season in an attempt to determine how these agents interact throughout the year. Farmer – trader interaction will require a more precise dataset that has the actual price that individual farmers and traders receive. A more robust cross-sectional dataset will be needed to tease a better picture of what is really occurring in these markets. Certainly other countries should be analyzed as data becomes available (Cameroon for instance), to better asses the effectiveness of reforms. Processor's interactions with chocolate manufacturers in the retail sector should also be examined in order to paint a clearer picture of total industry performance.

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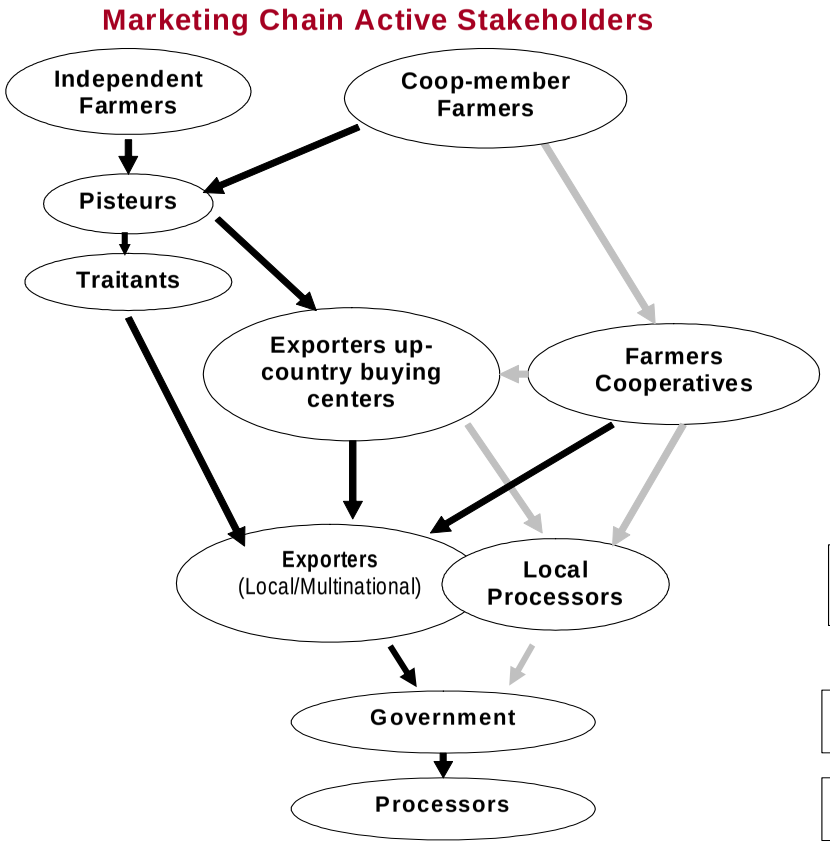
Figure 1: Stylized Cocoa Marketing Chain and Average Prices from Sample Period



Cocoa Status	Average Prices ($/mt)	Ivory Coast	Nigeria
Cocoa pod/beans	Farmgate Price	687	1072
Cocoa beans			
	Trader/ Co-op "Entrée-usine" price	827	n/a
Cocoa beans/powder/cake/liquor	Exporter price	1119	1323
Cocoa beans/powder/cake/liquor	Export tax	243	0
Cocoa beans/powder/cake/liquor	EU15 / US c.i.f. price	1362	1323

Figure 2: Evolution of Ivory Coast and World Prices during Sample Period

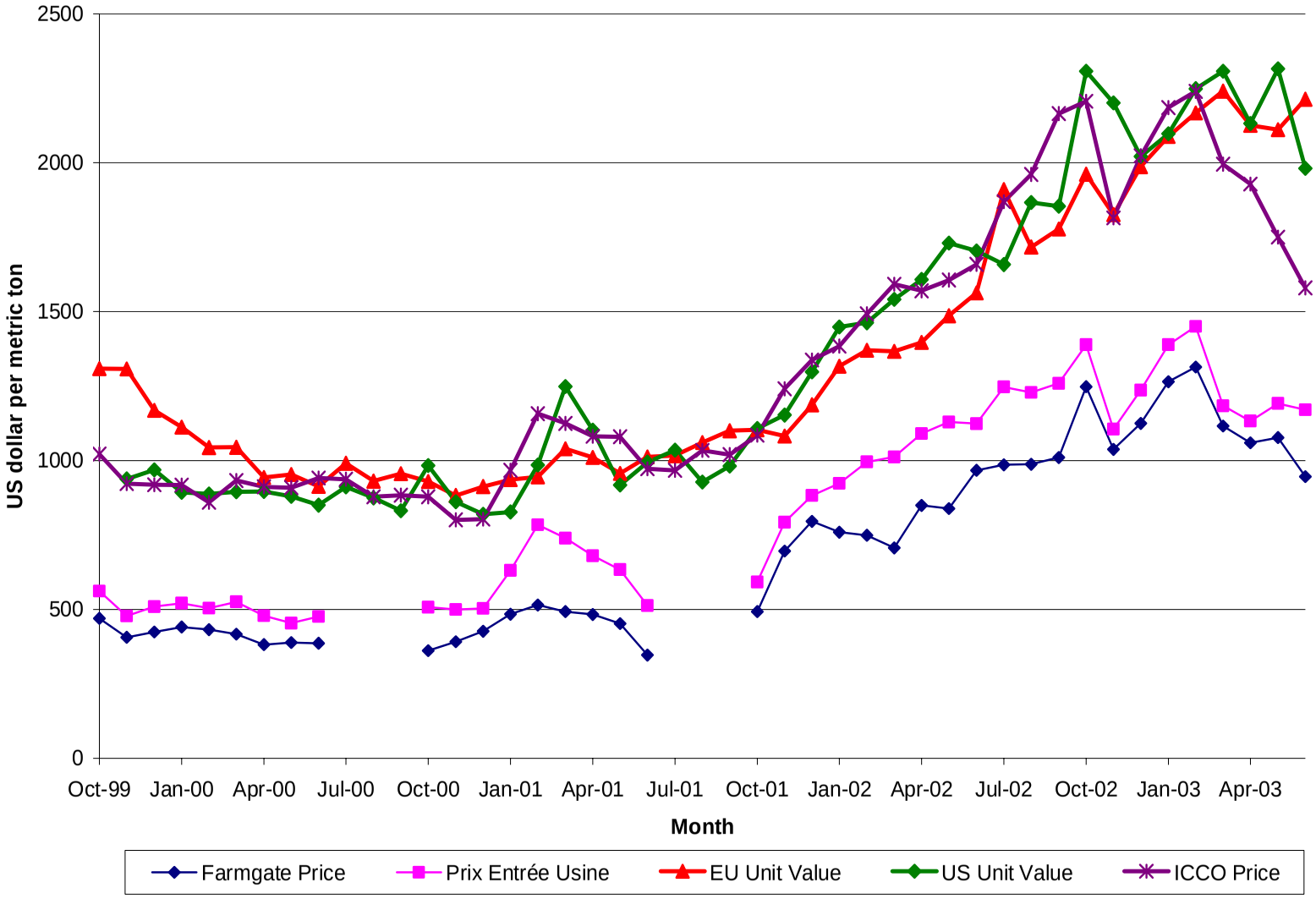


Figure 3: Evolution of Nigerian and World Prices from January 1997 to December 2002

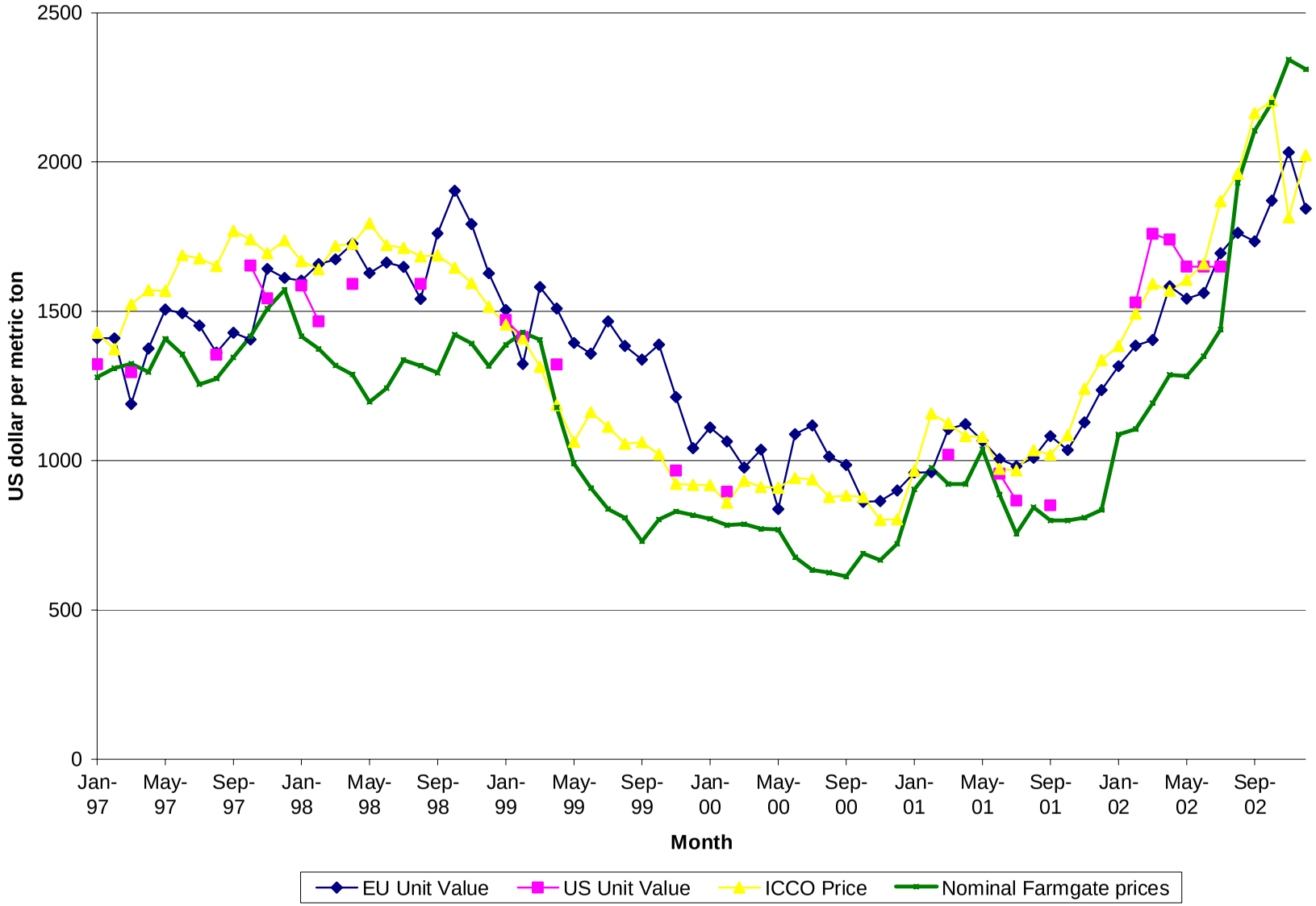


Table 1: Selected Exporter Market Shares, CR5 Concentration and Herfindahl Index for Ivory Coast from 99/00 to 03/04

Exporter	Parent Company	Country	% of Total Export for Season*				
			99/00[a]	00/01[b]	01/02[c]	02/03[d]	03/04[e]
ADM Cocoa Sifca and Unicao	ADM	USA	-	15.5	10.2	11.9	11.9
Armajaro		UK	-	-	-	0.7	3.3
Barry Callebaut and Saco	Barry Callebaut	Switzerland.	6.9	6.8	3.9	6.9	3.1
Cargill West Africa and Micao	Cargill	USA	9.5	15.8	9.8	15.1	16.4
Cemoi	Cantallou	France	4.0	3.1	0.0	4.2	3.8
Cipexi	Continaf	Netherlands	7.1	6.1	9.4	8.5	6.0
Cocaf Ivoire	Noble	China	-	-	5.7	3.4	4.4
Dafci and IFCO	Bollore	France	-	3.7	8.8	5.2	4.5
Delbau	Touton	France	7.2	8.0	8.5	6.0	4.7
Outspan Ivoire	Olam	Singapore	2.5	4.4	7.0	3.5	5.2
Proci	Gepro	France	7.2	7.2	8.2	5.1	6.0
Sifca-Coop		Ivory Coast	19.7	-	-	2.2	4.9
Tropival	ED&F Man	UK	11.5	12.1	10.8	9.6	8.3
Zamacom	Ecom	Switzerland	-	-	7.0	5.6	3.4
Percent of total (%) in sample			75.5%	82.7%	89.3%	88.0%	85.9%
Number of actual firms in sample			≈ 40	>35	>40	≈ 43	61
CR5 – Five Firm Concentration Ratio			55.1	58.6	49	52	48.6
Herfindahl-Hirschman Index			873.25	920.36	780.28	758.97	722.51
Equivalent Number of Symmetric Firms			11.5	10.9	12.8	13.2	13.8

* These market shares are calculated from exports of cocoa beans and cocoa products (as bean equivalents) declared by shippers and cocoa processors and represent a firm's share of the total amount declared for that season at that time. Firms are aggregated by parent company.

a = Oct 1,1999 to Sept 30, 2000; b = Oct 1, 2000 to Jan 1,2001; c = Oct 1 (22), 2001 to Jun 2,2002; d = October 1, 2002 to September 14, 2003; e = October 1, 2003 to April 21, 2004

Source: OsterDow Jones Commodity Wire and Reuters, various articles

Table 2: Regression Results for Ivory Coast for Seasons 99/00 to 02/03

Transaction	Conjectural Elasticity (Θ)	Fixed Marginal Cost (c)	Percent Markup/down (%)	Wald Test H_o: Θ = 0	R^2
Market Power of Government and Exporter					
Farmer to Exporter w/ Export Tax	0.7767[a] (10.24)	0.1778[a] (0.051)	36.5	Reject (104.79)	0.9425
Traitant to Exporter w/ Export Tax	0.6014[a] (4.86)	0.1166 (1.29)	30.7	Reject (23.65)	0.8674
Traitant to Exporter w/ Export Tax (not accounting for delivery lags across months)	0.4737[a] (3.04)	0.1993[c] (1.75)	24.6	Reject (9.24)	0.8035
Market Power of Exporter					
Farmer to Exporter w/o Export Tax	0.4793[a] (6.7)	0.1591[a] (3.65)	20.1	Reject (44.91)	0.9494
Traitant to Exporter w/o Export Tax	0.3142[b] (2.69)	0.0973 (1.25)	14.3	Reject (7.21)	0.8799
Traitant to Exporter w/o Export Tax (not accounting for delivery lags across months)	0.1882 (1.27)	0.1715[c] (1.73)	8.9	Do not Reject (1.6)	0.8164
Market Power of Traitants					
Farmer to Traitant	0.0034 (0.62)	0.0834[a] (3.4)	1.1	Do not Reject (0.39)	0.9305

t-values and test statistics are in parentheses

a, significant at P< 0.01; b, significant at P<0.05; c, significant at P<0.10. Wald Test where Pr > ChiSq is less than 0.01 for statistical significance