Does the WTO Increase Trade? The Case of U.S. Cocoa Imports from WTO-Member Producing Countries

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Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2010 AAEA,CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27, 2010

ABSTRACT

Market access to export cocoa beans in many cocoa producing countries has improved greatly due to trade liberalization in the cocoa sector. This has been accomplished through a variety of policy instruments, primarily structural adjustment programs (SAPs). In reducing or eliminating the role of state-owned and operated marketing and exporting boards, cocoa-producing countries have opened themselves up to foreign-owned corporate agribusiness exporting companies and producers have received a higher share of a lower world price. Trade liberalization was also accomplished through free trade agreements (FTAs) in a few countries from which the U.S. imports fewer cocoa beans than those that underwent SAPs. These major exporters also became World Trade Organization members in addition to the SAPs and FTAs.

This study analyzes U.S. cocoa bean imports from ten major cocoa-producing and exporting countries during the pre- and post-liberalization period of 1970-2007 using the The gravity equation and the one-way fixed effects model. The objective was to measure trade creation for a WTO member that has undergone trade liberalization. Cocoa beans can serve as a proxy for any tropical commodity upon which a developing country heavily relies on for export revenue, such as is the case with Côte d'Ivoire and cocoa, for example. Our results find FTAs and WTOs do contribute to increased U.S. cocoa bean imports at the one percent and ten percent confidence levels, respectively.

JEL Codes: *F10; F13*

Key Words: *Gravity models; Exports; Market liberalization; Cocoa; Fixed Effects, Random Effects and Pooled Models*.

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Introduction

U.S. imports' of cocoa beans have grown in recent years. This is due to increased cocoa production, lower world prices, greater centralization and efficiency in the supply chain, greater consumer demand for chocolate products due to the introduction of various niche markets, increased consumer per capita income, and trade liberalization, among other causes. Market access to export cocoa beans in many cocoa producing countries has improved greatly due to trade liberalization in the cocoa sector. This has been accomplished through a variety of policy instruments, primarily structural adjustment programs (SAPs).

In reducing or eliminating the role of state-owned and operated marketing and exporting boards, cocoa-producing countries have opened themselves up to foreign-owned corporate agribusiness exporting companies and producers have received a higher share of a lower world price. U.S. and European transnational corporations have become increasingly involved in more aspects of the cocoa bean supply chain, becoming the buyers and exporters of cocoa beans in producing countries with the scaling back or dissolution of commodity marketing boards in those countries. These corporations have also centralized grindings from a number of companies into the control of a few, larger corporations and have increased grindings in the producing countries.

Trade liberalization was also accomplished through free trade agreements (FTAs) in a few countries from which the U.S. imports fewer cocoa beans than those that underwent SAPs. This study also discusses the role that the World Trade Organization (WTO) has in agricultural negotiations. This section presents an overview of trade liberalization in the cocoa industry, changes in the market structure of exporting and marketing companies, and the U.S. market for cocoa beans and products.

Prior to trade liberalization, cocoa trade was inefficient and the share of the f.o.b. price received by farmers small (Varangis & Schreiber, 2001). Marketing boards were largely responsible for these faults, taking the lion's share of the f.o.b. in taxes while returning only some of it in the form of extension services and seed varieties. Many farmers smuggled to neighboring countries when those countries' market price was higher than their own, inflating export figures for the higher-priced countries and deflating prices for lower-priced countries (Bulíř, 2003). Cocoa exports were on the decline in many countries, such as Nigeria, where exports in 1985 – after the implementation of SAPs – were still below their 1970 levels, as oil became more vital to that country's economy (Kwanashie, Ajilima & Garba, 1998).

Following historically low prices in the 1970s, many cocoa producing countries underwent trade liberalization under SAPs from the World Bank and IMF. In Nigeria, SAPs were used as the "only alternative" toward improving agricultural output (Kwanashie, Ajilima & Garba, 1998). Marketing boards were restructured, replaced or eliminated and opened up to competition from private marketing and export companies. Beginning in the 1980s, these processes are still underway in Ghana and Côte d'Ivoire, the two highest-volume cocoa-producing countries in the world.

Trade liberalization has had both positive and negative impacts. It has brought a greater share of the f.o.b. price to cocoa bean farmers (Varangis & Schreiber, 2001). This greater share, though, is of a lower world price as production has grown and prices have harmonized across borders (Figure 3, Gilbert & Varangis, 2003). Marketing boards' roles have been reduced or eliminated and transnational corporations have replaced them in buying and exporting cocoa beans (Fold, 2002). Exporting has also undergone centralization, as these transnational firms have exercised comparative advantage against smaller firms (Fold, 2001). But by opening up

markets to foreign competition, farmers have become more vulnerable to price fluctuations, great and small, on the world market. World prices have also converged between countries and fallen during the trade liberalization period (Figure 1). For U.S. imports, trade liberalization has signaled lower world prices for firms buying cocoa beans from producing countries and lower prices for U.S. consumers buying the cocoa and chocolate products derived from them.

The move under trade liberalization from protectionist agricultural commodity policies toward open market policies for cocoa beans has implications for other commodities, as well, such as coffee, tea, sugar and cotton. These issues are especially relevant during the current Doha Round of World Trade Organization (WTO) negotiations, which are at an impasse as developing countries whose economies are dependent on agriculture square off against industrial countries seeking the developing countries' full market liberalization for agricultural goods.

This study researches the effects of trade liberalization and U.S. cocoa bean imports from ten major cocoa-producing and exporting countries for the pre- and post-liberalization period of 1970-2005. These countries are Brazil, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Ghana, Indonesia, Mexico, Nigeria and Papua New Guinea. At issue is not the countries' unwillingness to liberalize trade, as their governments have taken, willingly or unwillingly, the first steps through SAPs, FTAs and GATT/WTO membership to liberalize their agricultural markets, but to measure the potential growth for cocoa bean-exporting countries if trade were further liberalized under WTO negotiations. The U.S. represents the second-largest export market for cocoa beans, behind the Netherlands, and there has been a growth in exports of cocoa beans to the U.S. under trade liberalization. The impasse in WTO negotiations stands in the way of development through trade for the developing countries.

As the U.S., E.U, the WTO, World Bank and IMF promote trade liberalization for developing countries, analysis of its benefits needs to continually be taken into consideration. Improper sequencing of trade liberalization could lead to disruptions for any economy, and for countries like Côte d'Ivoire and Ghana, who receive a bulk of their GDP from cocoa exports, this can be disadvantageous. Also, given trade's potential for lifting millions of people out of poverty, trade liberalization has some potential to be extremely beneficial for farmers.Improved terms of trade for these countries can lead to further development in agriculture, as well as in other sectors. Increasing market access for their cocoa bean exports can help them achieve greater development and lift themselves out of poverty.

The objectives of this study are to measure trade creation for WTO member countries that have undergone trade liberalization. We do this using the gravity model and to measure the impacts of further trade liberalization of cocoa markets. The specific objectives are to provide descriptive analysis of marketing/distributing channels of U.S. cocoa bean imports from these ten countries, apply gravity models to econometrically determine the effects of trade liberalization and other economic factors on cocoa exports in a panel data setting; and to provide policy recommendations. Originally inspired by Newton's gravity equation in physics, the gravity model has become popular in regional science for describing and analyzing spatial flows.

Gravity Model

Anderson (1979) was the first to draw linkages to economic theory that was pioneered in the analysis of international trade by Tinbergen (1962); Pöyhönen (1963); and Linneman (1966). The generalized framework Anderson developed incorporates the Armington assumption, that goods produced by different countries are inherently imperfect substitutes by virtue of their provenance. Under the assumption of monopolistic competition, each country is assumed to

specialize in different products and to have identical homothetic preferences. Zero balance of trade is also assumed to hold in each period. Anderson built on the ordinary variables of dollar flow of a good from one country (or group of countries) to another as the dependant variable, and both parties' incomes (often measured as GDP), populations, the distance between the two parties and an error term, lognormally distributed with an expected value of 0.

As stated in the previous section, the gravity model was originally inspired by Newton's gravity equation in physics and has become popular in regional science for describing and analyzing spatial flows. The basic gravity model is often expressed as follows:

(1) $tf_{ij,t} = f(G_{i,t}, G_{j,t}, d_{ij,t})$

where

- tf_{ij} = value of trade between countries *i* and *j*,
- G_{it} & G_{jt} = income of countries *i* and *j* and is positively relate to trade,
- and a negative function of d_{ij} , the distance separating the two trading partners signifying transaction costs of commercial activity.

The generalized framework Anderson developed assumes Cobb-Douglas expenditure system and incorporates the Armington assumption that goods produced by different countries are inherently imperfect substitutes by virtue of their origin. Each country specializes in different products and has identical homothetic preferences under the assumption of monopolistic competition. Zero balance of trade is also assumed to hold in each period.

Recently, the application of gravity models has enjoyed a big revival. However, this has not so much been driven by its more rigorous theoretical foundation (Anderson, 1979; Bergstrand, 1985, 1989, and 1990; Helpman & Krugman, 1985; and Helpman, 1987) but the opportunity to project bilateral trade relations (Hamilton & Winters, 1992; Baldwin, 1994).

According to the traditional concept of the gravity equation, trade can also be explained by GDP and/or GDP per capita figures and both trade impediment (distance) and preference factors (common border, common language, etc.). The economic framework in most cases was cross-section analysis (Wang & Winters, 1991; Hamilton & Winters, 1992; Brulhart & Kelly, 1999; and Nilsson, 2000). Only a few authors made use of (random effects) panel econometric methods (Baldwin, 1994; Gros & Gonciarz, 1996; Mátyás, 1997; and Egger, 2002). Mátyás, (1997 and 1998) provides insights into the question of proper econometric specification without dealing with the issue of trading potentials.

The Econometric Model

According to the endowment-based new trade model with Dixit & Stiglitz (1977) preferences, bilateral trade is an increasing sum of factor income *G*, relative size *S*, and the difference in relative factor endowments *R*, and real bilateral exchange rate is denoted E. We use purchasing power parity, denoted *PPP*, in place of *E*. The presence of a free trade agreement between the producing country and the U.S. measured with the dummy variable *FTA*, and the effect of GATT/WTO membership is measured by the dummy variable *GATTWTO*. As this organization enforces trade liberalization and we can be certain of steps toward trade liberalization in agriculture for all countries only for years the Agreement on Agriculture (AoA) is in force, it could have been separated into pre-WTO and pre-AoA years denoted by a dummy variable 0, and post-WTO and post-AoA years denoted by a dummy variable with value 1. However, trade liberalization is not a process where a researcher can observe an import value and assign causation in a regression equation for increased or decreased import values under any liberalization policy. As such, if the country was a member of GATT *or* WTO, the value for

GATTWTO is 1, and 0 if a non-member. Applying the typical cross-section gravity equation to study trade effects of liberalization policies, we can specify the model as follows:

(2) $IMPVAL_{ijt} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 PPP_{ijt} + \beta_4 FTA_{ijt} + \beta_5 GATTWTO_{ijt} + \varepsilon_{ijt}$,

where all variables except FTA_{ijt} and $GATTWTO_{ijt}$ are in real figures, and the error term can be written as

(3) $\varepsilon_{ijt} = u_{ij} + v_{tj} + w_{ijt}$

with u_{ij} as the (one-way fixed or random) unobserved bilateral effect, v_{tj} as the (two-way fixed or random) unobserved time effect and w_{ijt} as the remaining residual error. The Heckscher-Ohlin (H-O) bilateral trade determinants can be formulated as the GDP of the cocoa bean-producing country GDP_{it} and U.S. GDP_{jt}.

$IMPVAL_{ijt}$ is U.S. cocoa bean imports deflated in real 2005 dollars from exporting country *i* to the U.S., denoted as *j*. GDP_{it} is the real GDP of the exporting country *i* in the year *t*. GDP_{jt} is the real GDP the importing country *j* in the year *t*. PPP_{ijt} represents the purchasing power parity between country *i* and country *j* in year *t*, expressed as national currency value of GDP divided by the real value of GDP in international dollars. International dollar has the same purchasing power over total U.S. GDP as the U.S. dollar in a given base year (2005 in PWT 6.3) (Penn World Table 2006, 2009). FTA_{ijt} and WTO_{ijt} represent the dummy variables of interest. As above, each takes the value of 1 if the country is a party to that trade liberalization policy and 0 if otherwise.

For the panel econometric projection of potential bilateral trade, many researchers have concentrated on the random effects model (REM), which requires that $u_{ij} \sim (0, \sigma_u^2)$, $v_{tj} \sim (0, \sigma_v^2)$, $w_{ijt} \sim (0, \sigma_w^2)$, and that u_{ij} *and* v_{tj} are independent of the w_{ijt}. Moreover, the X_{ijt} (i.e. the

explanatory variables) have to be independent of u_{ij} , v_{tj} and w_{ijt} for all cross-sections (*ij*) and time periods (*tj*). Whereas the fixed effects model (FEM) is always consistent in the absence of endogeneity or errors in variables, the REM is only consistent if the above-mentioned orthogonality conditions are fulfilled. Then, the REM has the advantage of more efficiency as compared to the FEM. If these conditions do not hold, only the FEM is consistent since it wipes out all the time-invariant effects (u_{ij}) and spatially-invariant effects (v_{tj}). The decision between the FEM and the REM models can be based on the Hausman (1978) test. Heteroskedasticity rarely occurs in time-series and panel data, but this study has corrected the errors through unequal variances resulting from different cross-sections through the FEM which assumes the intercept of each cross-sectional unit is different from the other and it never happened by chance.

The choice between a one-way FEM and a two-way FEM was determined through problems with multicollinearity. GDP_{jt} was found to be collinear with $IMPVAL_{ijt}$ in the two-way fixed effects model and an estimate was not able to be calculated. Dropping GDP_{jt} from the regression equation presents problems for our analysis because importing country GDP is an important theoretical predictor for import demand, measured by $IMPVAL_{ijt}$. Also, a Hausman statistic could not be calculated due to problems with rank between the REM and FEM. Because an estimate for GDP_{jt} could not be determined, a Hausman statistic could not be calculated through the comparison of the REM and FEM estimates. Thus, this study utilizes the one-way fixed effects model as the aforementioned orthogonality conditions were not met.

Data

The gravity model is applied using panel data for the period 1970 to 2007 for U.S. imports of cocoa beans from ten cocoa producing countries (five Latin American, three African, and two Asian). Data on nominal trade values (in $1000) for cocoa imports to the U.S. are from

the U.S. Census Bureau publication, "U.S. Imports for Consumption" for the years 1970-1988 and the U.S. International Trade Commission's Interactive Tariff and Trade Data Web from 1989 to 2007, at http://dataweb.usitc.gov/. These were deflated with CPI data obtained from the Federal Reserve Bank of St. Louis' Economic Research Division, at http://research.stlouisfed.org/. The purchasing power parity was obtained from Penn World Tables, http://pwt.econ.upenn.edu/, and GDP data (in U.S. $Billion) were obtained from the USDA ERS International Data Sets, http://www.ers.usda.gov/Data/macroeconomics/. Data for FTA and GATT/WTO were obtained from Rose's (2004) WTO data set at the University of California-Berkeley Haas Business School at http://faculty.haas.berkeley.edu/arose/. As trade liberalization is not a process whereby a country "flips a switch" and becomes liberalized overnight or from one year to the next, a dummy variable for FTAs and GATT/WTO membership simplifies this political procedure greatly. However, as there are few measures of trade liberalization (tariff reduction would be one), using a dummy variable is at least practical. The U.S. does not have tariffs on cocoa beans, but rather processed cocoa products.

The GATTWTO dummy variable was constructed with 1 representing full membership for greater than three months' membership for that year, and 0 representing less than three months' membership for that year. Three months was chosen because WTO *could* have some effect on a country's exports of its larger late harvest in Autumn. Entry years were obtained from the WTO web site. Trade liberalization was also measured by including a free trade agreement variable, FTA. Of the observed countries, the U.S. only has an FTA with Mexico, NAFTA, since 1994, and the DR-CAFTA countries, starting at different dates per country after 2006.

Estimation Procedure

Problems with a zero-value dependent variable were present. Taking the natural logs of these would provide undefined values. If a zero import value is present for a given country in a given year, it was left as zero in the analysis. In this analysis, several variations across individual country are analyzed in the one-way FEM, the two-way FEM, the one-way REM, and two-way REM. The dependent variable, observed real value of U.S. cocoa imports $IMPVAL_{ijt}$, was regressed on each exporting country's GDP GDP_{it}, the U.S.' GDP GDP_{jt}, distance D_{ijt}, purchasing power parity PPP_{ijt}, and the presence of trade liberalization policies, FTA_{ijt} and WTO_{ijt}. Estimates for the other observable determinants impeding or inducing bilateral trade (common border, common language) dropped out in the final models together with distance as they are all time-invariant dummy variables. Linear, log-log, lin-log and log-lin variations of the one-way and two-way REM and FEM were used to determine the best fit.

Results and Discussion

To examine the empirical validity of the gravity model with respect to cocoa bean trade potential between U.S. and twenty-one exporting countries from 1970 to 2007 equation (2) is estimated. The descriptive statistics of the variables in the model are reported in Table 1. On average, the value of cocoa imports to the U.S. from 1970-2007 is about $77 million. This statistic is no surprise as the U.S. chocolate industry uses very little of cocoa as an input – 5 to 10 percent of the value of the bar (Gilbert and Varangis 2003). The mean of GDP for exporting countries was $79.9 billion, with a minimum and maximum of $2.05 billion and $1.1 trillion, respectively. U.S. GDP ranged from $4.3 trillion to $13.1 trillion. PPP ranges from 0 units to 3105 units, with the mean being 109 units. Exporting countries were members of FTAs 3.9 percent of the observations, and GATT/WTO 77 percent of the observations.

Table 2 presents the country effect results for the one-way fixed effect panel estimators, while Table 3 presents the parameter estimation results for this regression. According to the test statistics we cannot ignore the cross-sectional effects as the F-test for the one-way FEM is significant at ($P < 0.0001$) with R^2 of 0.57. The F-test for the two-way FEM is also significant at ($P<0.0001$) with an R^2 of 0.63, but without an estimate for GDP_j, the importing country's income, the two-way FEM cannot be a good predictor of cocoa bean imports (a demand function). Thus, the probability that there are no effects in the model is 0 and thus the probability of the one-way or two-way REM being a better fit is 0. A linear model yielded results more in line with expectations, as log-log, log-linear and lin-log models all yielded results that had the opposite signs expected, or had results that were not statistically significant. Past gravity equation studies have used log-log model results, but many of these analyzed whole sectors such as manufactures or agriculture, whereas this study only analyzes one commodity which is not a significant import by share of U.S. import values.

Many country effects were also significant, relative to Papua New Guinea. For instance, for a $1000 dollar increase in Brazil's cocoa bean exports to the U.S., Papua New Guinea's cocoa bean exports will increase $192,111. For a $1000 dollar increase in Côte d'Ivoire's cocoa bean exports, Papua New Guinea's exports to the U.S. will decrease by $18,687, suggesting that the U.S. will be purchasing more cocoa beans from countries exercising a comparative advantage in cocoa beans to satisfy consumer demand. Nigeria was the only country that showed no significant impact on exports from Papua New Guinea to the U.S.

The coefficient of the exporting country's GDP is negative and statistically significant at ($p < 0.0001$). Thus, the larger the per capita GDP for the exporting countries the smaller the trade value of cocoa bean exports. A one percent increase in the GDP of the exporting country will

lead to a 0.04 percent decrease in the export value of cocoa beans to the U.S., possibly because that country is slowly developing and shifting away from the agricultural sector and into manufacturing or services.

The GDP of the importing country is also significant, but negative. A one percent increase in U.S. GDP leads to a 0.09 percent decrease in U.S. cocoa bean import value. This may be because cocoa makes up a small share of the U.S.' food expenditures and an increase in GDP would not necessarily mean an increase in cocoa bean imports, or that consumers with higher incomes are more often more educated about health issues and thus consume fewer cocoa products, due to their high fat and sugar contents. However, during the present recession, chocolate is a good that Americans still seem to be buying, perhaps more than before the recession began (U.S. News and World Report, 2009).

PPP is significant and positive at ($P< 0.0001$). An increase in PPP will lead to a 0.02 percent increase in U.S. cocoa bean import value as the terms of trade improve for producers and they're able to purchase more inputs and other goods.

The dummy variables that are the focus of this study on trade liberalization, *FTA* and *GATTWTO*, are significant at ($P\leq 0.01$) and ($P\leq 0.10$) and positive. Trade liberalization appears to increase cocoa exports from producer countries per annum. Participation in FTAs lead to a 0.0034 percent increase in the amount of cocoa beans imported by the U.S. Also, membership in GATT/WTO increases U.S. cocoa bean imports 0.026 percent. This could also incorporate gains made under SAPs and other measures, showing that trade liberalization on the whole has been beneficial under GATT/WTO, SAPs, FTAs and other measures to increase U.S. cocoa bean imports. This lends support to studies counter Rose's study (2004) that there is no empirical

evidence that membership in the GATT/WTO increases trade, though with a 10 percent threshold, these results only lend mild support for the WTO tropical products deal.

Conclusion

Economic theory informs us that at the individual country level, border relaxation reduces domestic prices that help local consumers and increases the profit for low-cost exporters through increased sales in the foreign market. At the global level, trade liberalization causes demand and supply to expand, both of which improve price signals and improves world welfare.

Theory also teaches us that there are many other socio-economic and political-institutional determinants of cross-border trade, including market size, geographical proximity, tastes and preferences, cultural ties, and financial linkages. This paper used a linear one-way fixed effect panel estimation to determine the influence of the various factors driving the value of U.S. imports from major cocoa exporting countries.

One noteworthy finding is that the GDP of exporting and importing countries decreases cocoa bean trade. PPP also matters, as the terms of trade for cocoa-producing countries improve, so does their ability to produce as they choose to invest in cocoa forests and not in timber or products requiring fewer inputs. But as producers' share of world price of cocoa through trade liberalization grows, production increases and the volume of exports rises. Finally, important to this study on the effects of trade liberalization of cocoa bean producer markets on U.S. imports, trade liberalization through membership in the GATT/WTO and FTAs is shown to positively influence U.S cocoa bean imports from producing countries.

Comparative advantage under trade liberalization has been shown to have a positive effect on U.S. cocoa bean imports, which would lead us to believe this trade would contribute positively to the terms of trade, holding other agricultural goods and industries equal. This would

lead to greater development for the cocoa bean producers and give them a means to invest in their development, making increased education for the community, increased infrastructure, health care, or other goods harder for producers to afford. It could also lead to an investment in improving the quantity or quality of cocoa beans they produce or a divestment from growing cocoa altogether as demand from the U.S. increases.

For the U.S., it gives consumers more cocoa beans with which to produce cocoa products. Though a small share of consumer income spent, it is still beneficial to consumers to purchase goods at a lower price, so long as producers benefit on the production end for a mutually beneficial relationship between trading partners. Ensuring that current and future agreements have language protecting both the consumers and producers so that the trading relationship continually improves between both partners for the development of the producers and the financial welfare of the consumer is important to the success of trade liberalization. Also, as noted in the introduction on the effect of trade liberalization on the political ecology of producers, it is important that trade liberalization protect the local environment for producers by working to improve information channels and other factors influencing production to keep prices equitable for producers to keep them from clearing more forests or using more agrochemicals which cause damage to the ecosystem. Organic and/or Fair Trade certifications offer producers increased prices on these niche markest.

As FTAs were part of the trade liberalization analysis and have a significant and positive effect on cocoa bean exports, care should be exercised in future FTA negotiations and legislation, such as those with Colombia and Panama, and with cocoa-producing countries possessing FTAs with the U.S., such as Mexico, the DR-CAFTA countries, Chile and Peru, that the welfare of producers is improved through these agreements. FTAs should help producers

increase their share of the cocoa price to improve the livelihoods of these people and their communities and their local environment. Fair Trade certification under FTAs is one such way to accomplish this.

As trade liberalization under GATT/WTO was shown to have a significant and positive effect on U.S. cocoa bean imports, it is recommended that care be taken in negotiations as the Doha Round of WTO negotiations goes forward so that membership benefits the development of producing countries specializing in tropical export products, like Côte d'Ivoire and Ghana, and benefits U.S. consumers of chocolate and other cocoa products. The current negotiations of a broad deal on the treatment of tropical products, with the new WTO exception for bananas, in the Doha Round should offer producing countries a path toward increased development through increased market access, and not vice versa (ICTSD, 2010). Trade liberalization under SAPs has not proved well for import-substituting industrialization. For example, Ghana's economy is still very much focused on gold, cocoa and timber (Mkandawire & Soludo, 1999). Smallholder dynamism can play a mitigating role in this, as evidenced by the Kuapa Kokoo cooperative in Ghana and its relationship with the Day Chocolate Company and Fair Trade Certification (Tiffen 2002; Doherty and Tranchell 2007).

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Table 1. Descriptive Statistics

Variable	N	Mean	Std. Dev.	Sum	Minimum	Maximum
IMPVAL	380	77220	99412	29343437	0	529611
PPP_{ij}	380	109.202	364.880	41497	0	3105
Y_i	380	144.331	241.912	54846	2.046	1072
Y_j	380	7992	2634	3036855	4262	13050
FTA_{ij}	380	0.039	0.195	15	0	1
$GATTWTO_{ij}$	380	0.771	0.421	293	0	1

Table 2. Fixed One-Way Country Effects

Number of Cross Sections	10
Time Series Length	38

Fit Statistics

SSE	1.61E+12	DFE	365
MSE	4.40E+09	Root MSE	66352.66
R-Square	0.571		

F Test for No Fixed Effects

Num DF	Den DF	F-Value	Pr > F
9	362	35.9	<.0001

Parameter Estimates

Country	DF	Estimate	Standard Error	t -Value	Pr > |t|
Brazil	1	192.110	38.737	4.96	<.0001***
Costa Rica	1	-31.679	15.380	-2.06	0.0401**
Cote d'Ivoire	1	186.871	18.056	10.35	<.0001***
Dominican Republic	1	41.236	17.688	2.33	0.0203**
Ecuador	1	33.083	15.256	2.17	0.0308**
Ghana	1	59.526	17.718	3.36	0.0009***
Indonesia	1	-42.886	22.954	-1.87	0.0625*
Mexico	1	47.207	27.975	1.69	0.0924*
Nigeria	1	22.936	18.095	1.27	0.2058

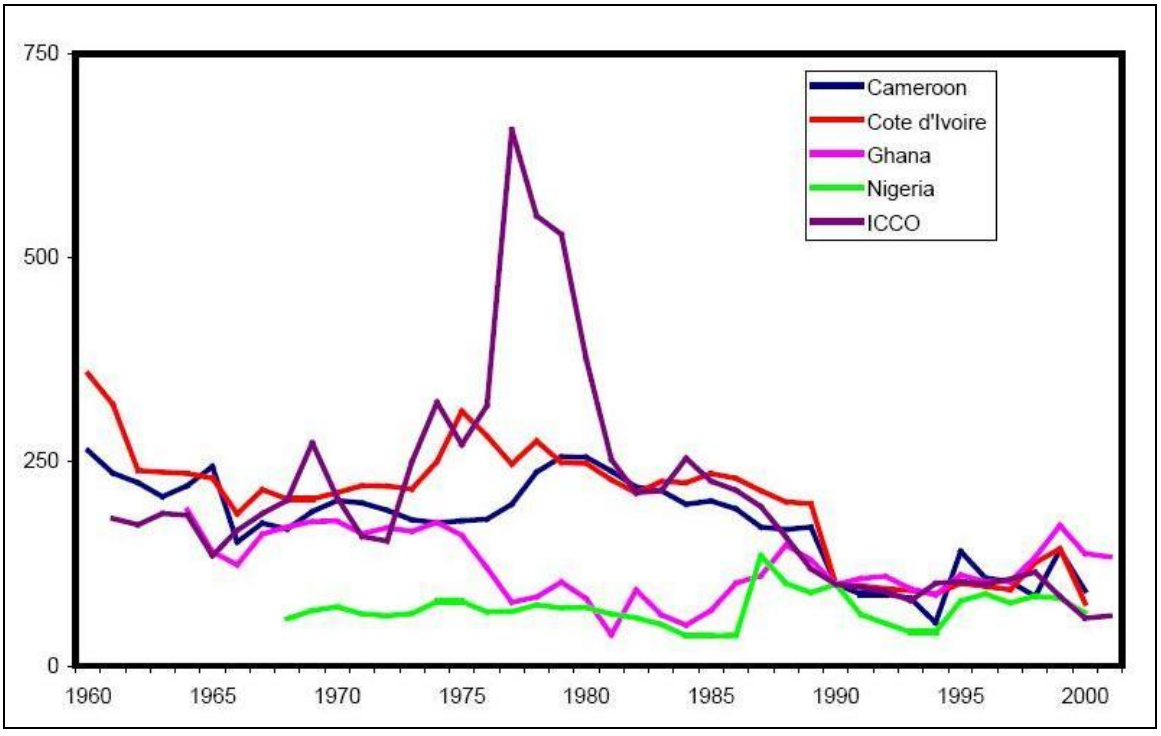
* - Significant at 10%
** - Significant at 5%
*** - Significant at 1%

Table 3. Fixed One-Way Parameter Estimates

Variable	DF	Estimate	Standard Error	t-Value	Pr > |t|
Intercept	1	90.823	16.924	5.37	<.0001***
PPP_{ij}	1	0.117	0.014	8.46	<.0001***
Y_i	1	-0.196	0.051	-3.85	0.0001***
Y_j	1	-0.009	0.002	-4.81	<.0001***
FTA_{ij}	1	66.819	24.920	2.68	0.0077***
$GATTWTO_{ij}$	1	26.170	13.757	1.9	0.0579*

* - significant at 10%
** - significant at 5%
*** - significant at 1%

Figure 1. Deflated Cocoa Producer Prices and Deflated ICCO Indicator Price, West African Countries (1985 = 100)



Source: Gilbert and Varangis (2003)