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LIBERALISATION OF TROPICAL COMMODITY MARKET AND ADDING-UP PROBLEM: A BOUND TEST APPROACH

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ABSTRACT

The paper examines the effect of commodity market liberalisation on developing countries by taking the case of tropical products. This issue assumes importance in the context of developing countries characterised as they are by heavy dependence on commodity exports. Theoretically, commodity market liberalisation could adversely affect the terms of trade of exporting countries, as the price and income elasticity of demand for the commodities are relatively low. The problem arises as the welfare effects of unilateral liberalisation by an individual country having a small market share differ from the multilateral liberalisation by a group of producing countries who collectively constitute a major share of the market. This collective liberalisation in most of the cases can result in a decline in prices. In this paper we examine this phenomenon-the adding up problem- using Bound Test Procedure which is an advanced approach for testing the existence of long run relationship. The major finding of the study is that along with product specificities, export structure of the countries concerned is also an important factor in determining the adding up problem.

Key words: Tropical commodities, market liberalisation, Adding up Problem

JEL Classification: F13

Introduction

Tropical commodities are a distinctive class of agricultural commodities produced in the tropical and sub tropical climates, belonging mostly to the developing regions of the world. They are held to suffer from typical commodity problems, viz, short run fluctuations in prices and long run deterioration in terms of trade (Maizels A, 1992; Haque Irfan ul 2004). Further, many countries exporting tropical commodities depend on one or two commodities not only for foreign exchange, but also as a main source of livelihood for their population. Also since tropical products are mostly traded commodities, population subsisting on them are vulnerable to national and external shocks.

In view of the product specificities and the role it played in national economies, efforts were made in the past, both at the national and international level to regulate the tropical commodity market. At the level of individual nation states the efforts were typically to regulate supply, marketing and prices with a view to ensure stable income to the producers. At the International level various commodity agreements were formulated to stabilize the commodity prices with producing and consuming countries as members.

However, in an effort to increase income from trade, tropical commodity market underwent many changes in the late 20th century. Though the timing of reforms differed in different countries it followed a similar pattern in almost all countries. They were introduced as part of

the larger economic reforms in many of the countries and reflected to a great extent the changing economic philosophy of the time. It moved away from interventions, both domestic and international, to free market with state or commodity agreements playing a limited role.

Critics have raised several concerns about the effect of liberalisation. One such concern is regarding the adding up problem which points out the fallacy of small country assumption when a group of countries liberalise their economies. The argument is that while liberalisation makes sense for an individual country, it may not be so for a group of countries. A collective devaluation, for instance, may result in an increase in exports which in turn may pull down the prices and earnings. Theory shows that it may happen in specific circumstances when commodities concerned are having low income and price elasticities (Bhagavati, 1957, Wattleworth 1988, Bleaney 1993) which makes it applicable in the case of primary commodities. In this paper we examine this phenomenon, the adding up problem, by taking the case of four commodities, viz, coffee, cocoa, tea and rubber, which have undergone liberalisation in different degrees.

The paper is organised as follows. The following section gives a brief overview of the commodities we selected for analysis apart from outlining the reform measures introduced in major producing/exporting countries. Section 3 introduces the theoretical premises, methodology and data set. The fourth section provides the estimates of the econometric model and interpretation of the results. The paper concludes with a summary and policy implications.

Section 2: Market Liberalisation in Commodity Market

In the context of this paper, the term market liberalisation refers to steps taken towards (i) opening up domestic and export market to competition by allowing private players and (ii) removing intervention in commodity prices. Measures implemented to achieve these goals varied

but often included elimination or privatization of government marketing agencies, introduction of competition in marketing, elimination of administered prices, reduction in explicit and implicit taxes, and privatization of government-owned assets. (Akiyama et al, 2003, Spoor, 1997). Though, as a general matter most governments adopted these broad market oriented strategies, the degree of market reform differed significantly among countries as well as commodities.

The commodities selected for this study are the most traded among the tropical products. Moreover, they represent reforms introduced in different degrees. In the case of coffee and cocoa reforms were intense, while rubber and tea market witnessed comparatively moderate reforms. The following sub section gives a detailed review of reforms introduced in each commodity market.

i. Coffee

Coffee is a major traded tropical commodity in the world accounting for trade worth approximately US$ 5.6 billion in 2000-01. Its production is scattered around three continents with Brazil contributing a major share followed by Vietnam. Coffee was the most protected commodity after oil in the post world war era. It is the major foreign exchange earner for most of the producing countries and for the major consuming countries it is more or less a necessary good. Because of its importance to the national economy in most of the producing countries coffee production and trade were under the direct control of the government. And the regulatory regime was quasi- governmental or co-operative. The history of this protection can be traced back to Brazilian Valorisation scheme to control supply way back in 1902. In most of the producing countries government organisations like Brazilian Coffee Institute (IBC), *Caisse de Commercialisation et de Stabilisation des Prix du Café, de la Vanille et du Girofle* (CAVAGI) in Madagascar, National Federation of Coffee Growers of Columbia (*Federacafe*), were active in controlling the supply so as to stabilize coffee prices. India was an

extreme case of regulatory regime in which a statutory agency had near monopoly on procurement and distribution of coffee.

However, as liberalisation gained momentum in most of the producing countries the state started withdrawing from many of its interventionist roles, limiting its functions to promotional activities. Coffee market reforms were primarily instigated by the financial problems in coffee producing countries due to the sharp decline in coffee prices following the collapse of International Coffee Organisation's (ICO) Quota system in 1989. The elimination of ICO quota undermined much of the justification for government marketing agencies. The main reason for the abolition of parastatals in Brazil, El Salvador, and Mexico were the government's recognition that the suspension of International quota effectively ended the need to control domestic coffee market. In many countries producers became skeptical of pricing system when prices declined as it happened in India (Akiyama, 2001). In Sub-Saharan Africa the serious fiscal problems resulting from sharp decline in commodity prices forced many governments to look to International Organisations and donor agencies for financial assistance (Akiyama et al 2001). This came with strings attached in the form of conditionalities requiring market reforms. As a result private traders were allowed in the coffee market and government withdrew its economic functions by concentrating only on promotional activities.

ii. Cocoa

Cocoa is the second most traded tropical commodity with a trade worth $2.5 billion in 2000-01. The major producers as well as exporters of cocoa are the West African countries particularly Côte d'Ivoire, Ghana, Nigeria and Cameroon together contributing around 66% of total world exports in 2002. Besides, Indonesia is also a major exporter with a share of 14%. World Cocoa market was regulated both at the national and International levels. Internationally, the International Cocoa Agreement run by the International Cocoa Organisation (ICCO) operated a buffer

stock programme aimed at defending world prices within a certain price range. During late 1980s the decline in world cocoa prices forced the buffer stock to its limit and efforts at price stabilization were effectively abandoned from 1988. Even when the buffer stock existed, it failed to stabilize cocoa prices and hence was not a major player in the cocoa market. Hence, restrictions which actually mattered in the market were at the national level in various producing countries.

Restrictions in the national level generally falls into three main categories; free market systems, marketing boards and stabilization funds. (Akiyama et al, 2001). In a free marketing system, government is not directly involved in marketing the crops and prices are determined by market forces. Nonetheless, the government may retain the right to intervene if it needs to co-ordinate or regulate the actions of agents in the system. In practice, however, government control is limited to quality control, taxation and general supervision. Free market systems are prominent in Brazil, Indonesia, Malaysia, Cameroon (since 1994-95), Côte d'Ivoire since 1999 and Nigeria since 1986. The next category is the marketing board which is a parastatal with a monopoly over internal and external marketing. It controls all the nodes of the marketing chain and was prevalent in Nigeria until 1986. Ghana also falls under this category, though, some reforms have been introduced from 1992-93. In the third case, i.e. Stabilization fund, internal prices are administratively determined as in the case of marketing board. But it does not control each and every aspect, rather, it issues licenses to the agents who buys and sells the products. Cameroon till 1993-94 and Côte d'Ivoire until 1999 followed the system.

It was pointed out that in countries where markets are controlled, operation costs are high resulting in low share of f.o.b. prices to the farmers (Gilbert and Varangis, 2003, Akiyama et al, 2001, Gilbert 1997). The administered pricing system are argued to be inefficient as it does not

transmit market signals to producers, creating distorted incentives and inducing misallocation of resources. Along with these inefficiencies, the financial difficulties faced by the controlling bodies, and the external pressure proved fatal to the institutions which finally led to the elimination of marketing boards and stabilization funds. Now with the exception of Ghana, which is also undergoing reforms, all the producing countries have moved to a free market system. With reforms private traders are allowed to procure cocoa directly from the farmers and sell it to exporters. Producer prices are now determined entirely by the market and all restrictions on when and where buyers may purchase cocoa beans is eliminated.

iii. Tea

Tea, a tropical crop like coffee and cocoa is produced more in developing countries of South Asia, Latin America and Africa. In South Asia the major producers are India, Srilanka, China, Indonesia, Turkey and Bangladesh. In Africa tea is chiefly cultivated in Kenya and to a small extent in Malawi, Rwanda and Tanzania. In Latin America, Argentina is the sole producer of tea. India is the major producer followed by China and Srilanka. Coming to exports Srilanka is the major exporter as India and China consumes a major share of their produce.

World Tea market is relatively less regulated than the other three commodities. Nevertheless, a glance back to the history shows instances when tea trade was regulated. In 1929, the British and Dutch producers in India and Dutch East Indies (currently Indonesia), fearful of a world surplus and a subsequent drop in tea prices agreed to restrict exports on a voluntary basis which continued up to 1931. Again in 1933 International Tea Committee was set up by representatives of tea growers in India, Ceylon (present Srilanka) and Dutch East Indies. The scheme was successful in stabilising prices but was permanently abandoned in 1955 due to difference of opinion in allotting quotas.

At the national level restrictions were mostly in the form of commodity boards as in the case of Srilanka, India and Kenya. In the

case of India as per the tea board Act it can regulate the production and the extent of cultivation of tea and also the sale and export of tea. But these provisions are rarely used. Srilanka tea board mainly concentrates on promotional activities and issuing of licenses for exports. Among the major producers Kenya tea market was highly regulated, but with economic reforms Kenya Tea Development Agency Ltd, previously a state corporation was transformed into a private company.

Nonetheless, many producing countries consume a major portion of its produce, making it less dependent on the International market. Among the major producers India retained 77% of its total output, China (70%), Turkey (97%), Indonesia (41%), Vietnam (39%), Japan (99%) for domestic consumption in 1999. In contrast Kenya retains only 3% and Srilanka 7.5% of its total production thus exporting a major share of its produce. (Asopa, 2004).

iv. Natural Rubber

In the case of rubber, regulations were at the International level maintained through the International Rubber Agreement (IRA) which tried to achieve a balanced growth between the supply and demand for natural rubber. To achieve stable condition in natural rubber trade by avoiding excessive price fluctuations, an International Buffer stock was established as the sole instrument of market intervention. The third International rubber agreement which came into force in 1997 faced some unanticipated difficulties in the aftermath of East Asian crisis which affected the major producers of rubber like Thailand, Malaysia and Indonesia. As a result of currency devaluations, IRA's reference price which was a hybrid currency made up of Malaysian ringgit and Singapore dollar was artificially inflated against the US dollar which kept the indicator price above the intervention levels. As a result, INRO's measurement of market trends got distorted and its market interventions were greatly delayed, despite the continuous fall in market price. Along with this the lack of funds hindered further intervention.

Around this time Malaysia and Thailand two major exporting countries withdrew from the agreement and Srilanka also followed suit. Finally, the International Rubber council decided on terminating the IRA with effect from 1999 and the buffer stock was dismantled. At the national level the major exporting countries followed a market oriented approach. However, governments maintained the right to intervene in the market when they deem necessary. Lately, when rubber prices plummeted governments of the three major producers regulated the prices through export and production retention.

Thus, all the commodities were regulated in one form or another, though the severity of restrictions varied from commodity to commodity. Out of the four commodities coffee and cocoa were the most regulated ones mainly because of the role it played in the concerned national economies. In the case of coffee regulations in national and international level worked concurrently, while in the case of cocoa, restrictions were imposed at the domestic level. Rubber trade was subjected to restrictions at the international level till 1999, even though domestic markets were mostly unregulated. Compared to these three products tea remain unrestricted with the exception of Kenya. Since restrictions were prominent in the case of cocoa and coffee, reforms were more in the case of these two commodities. Vietnam is an exception to reforms in all the cases as state plays a greater role in production and marketing even now.

Section 3: Adding up Problem: A Theoretical Exposition

Adding up problem or the Fallacy of Composition in simple terms means that what is viable for one country acting in isolation may not be viable for a group of countries acting simultaneously. In the former case effect on price will be less as the country concerned is having only a small share and is a price taker. But once majority of countries liberalise the small country assumption is violated and they become the price makers. The group of countries by increasing their exports drives down

the prices and in turn the revenues received from these products with the result that the countries are actually made worse off. This view was first brought out by Bhagavati (1957) and Johnson (1953) in the context of Immiserising growth. This is applicable to products facing low elasticity.

This idea was empirically tested in the case of export of labour intensive manufactured products. In the context of success stories of newly industrialized countries in East Asia, it was advocated that other developing countries also should follow export oriented path, particularly labour intensive exports in which developing countries have an advantage. Criticising this view it was pointed out that it will be a fallacy if other countries also follow a path of exporting more as elasticity of these products are low. In this context Mayer, J (2003) had identified four versions of fallacy of composition that have been developed in literature. (1). an early version pioneered by Cline (1982) emphasizing the protectionist policies of developed countries. (2) a version by Faini, Clavijo and Senhadji-Semlali (1992) focusing on elasticity of export demand from a partial equilibrium point of view (3) a version identified by Havrylyshyn (1990) and later empirically tested by Martin (1993) that highlights the general equilibrium nature of the fallacy of composition. The fourth version of fallacy of composition argument emphasize on the terms of trade of developing country export of manufactures. Streeten (`1991) questions the fallacy argument in the context of labour intensive manufactures pointing out that phasing of trade liberalisation and export-orientation will be different for different countries and not all exports will be dumped simultaneously. Further, a part of produce is exported to other developing countries also where protection is less compared to developed countries. UNCTAD Trade and Development Report (2002) give a detailed examination of this phenomenon.

Studies on fallacy of Composition in the context of primary commodities generally take into account the market share of respective countries and the elasticity of demand and supply of the concerned product. Wattleworth (1988) develops a theoretical model to examine the effect of collective devaluation on commodity prices, volumes and export receipts and points out that the effect depends upon the elasticity of demand and market share.

Most of the empirical works looked into the case of Sub-Saharan Africa as these countries are mainly commodity dependent. Gilbert and Varangis (2003) by taking the case of four major cocoa producers in West Africa found that liberalisation by a group of countries have a larger effect on prices than unilateral liberalisation thus confirming the existence of adding up problem. In a similar study Akiyama and Larson (1994) discuss the effects of adding up problem on policy and development strategies for major agricultural commodities in Sub-Saharan Africa. He finds that Sub-Saharan Africa as a single entity faces adding up problem than that of the individual countries. And among the commodities studied cocoa, coffee, tea and tobacco faced this problem but cocoa suffers the most.

Overall, only a few studies have looked into this aspect of reform. These studies have taken the case of Sub-Saharan Africa where reform was prominent and followed almost a uniform pattern. In this study we are interested in examining the adding up problem in the context of commodities and countries which have undergone reforms in different degrees. We use the Bound Test Procedure for verifying it empirically.

3.2 Methodology

Fallacy of Composition occurs when due to an increase in quantity, prices decline to such an extent that the export earnings decline or increase less than proportionate to an increase in quantity. For verifying this we start with the following identity.

$R = PQ$

where R is export revenue

P is the export price

Q the export quantity.

Transforming to log

$\ln R = \ln P + \ln Q$

Differentiating by Q

$$\partial \Big/ \partial = \partial \Big/ \partial + \partial \Big/ \partial$$

i.e.

$$\partial \Big/ \partial = + \partial \Big/ \partial \quad --------$$

Here, $\partial \Big/ \partial$ is the Elasticity of Export Revenue with respect to Volume (ERV). ERV, as the term implies, considers the change in revenue from exports as a result of change in export volume. This concept is developed by Akiyama and Larson(1994). ERV as estimated by Akiyama and Larson takes into account the demand and supply elasticity along with the market share of the country. But for this analysis we are estimating it directly as many of the elasticity coefficients are insignificant for some countries and commodities, which make comparison difficult across the product group and countries. The second term $\partial \Big/ \partial$ gives the effect of quantity increase in price of the commodity. It is calculated as follows:

$$= \alpha + \beta + \varepsilon --------$$
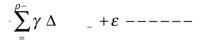
Hence;

$$= + \beta$$

Lower the value of ERV the more acute is adding up problem as an increase in quantity is followed by less than proportionate increase in revenue.

It is very often pointed out that many of the time series variables are non-stationary, so that it may give spurious results while analyzing the long run relationship. In such data the assumption that the error terms from successive observations are uncorrelated, is frequently invalid. The emergence of the unit roots and Cointegration literature as pioneered by Granger (1981), Granger and Weiss (1983), Engle and Granger (1987) and Johansen (1988, 1991) has encouraged and enabled applied economists to test for the existence of long-run relationships postulated by economic theory rather than taking them for granted.

All these methods concentrate on cases in which the underlying variables are integrated of order one. This inevitably requires pre-testing procedures for establishing the orders of integration and hence has introduced an additional element of uncertainty into the econometric analysis of time series data. And many a times it was proved that the conventional Dickey-Fuller test and augmented Dicky Fuller test for estimating the orders of integration lack precision while dealing with time series data with structural break (Peron, 1989; Rappoport and Reichlin 1989). In this background Pesaran et al. (1999) brought out the bounds test (Auto Regressive Distributed Lag) (ARDL) model for establishing long run relationship. One advantage of this method over the other is that it is applicable irrespective of whether the underlying variables are purely I(0), purely I(1) or mutually cointegrated. Many of the variables considered in our analysis are I(0) or I(1), which makes applying other test difficult. The ambiguity in integration of variables lends support to the use of bounds method rather than any alternative Cointegration test.

The ARDL approach to cointegration (Pesaran et al, 2001) involves estimating the conditional error correction version of the ARDL model for the dependent and independent variables. For our analysis the variables are export price and export quantity and a dummy is included to examine the role of reform process. The model is:

$$\Delta \quad = \alpha + \alpha \quad + \alpha \quad + \beta \quad _- + \beta \quad _- + \sum_{=}^{\rho-} \gamma \Delta \quad _- +$$

$$\cdot \sum_{=}^{\rho-} \gamma \Delta \quad _- + \varepsilon \;\; ------$$

where ρ is the order of the lag and D is the Dummy for reforms.

We then 'bounds test' the above equation for the presence of a long-run relationship between export price and export quantity using two separate statistics. The first involves an F-test or Wald test on the null hypothesis that the level variables are jointly equal to zero irrespective of the order of integration. Two sets of critical values are provided for the two polar case which assume that all the regressors are, on the one hand, purely I(1) and on the other, purely I(0). If the computed F statistic falls beyond the critical bounds, then we reject the null hypothesis that there is no level relationship between these variables. If the statistic falls inside the critical bounds, then, inference is inconclusive and knowledge of the integration of variables is needed before conclusive evidence can be made. The second is a t-test on the lagged level dependent variable in an unrestricted conditional ECM. The statistics have a non-standard distribution and depend on whether the variables are individually I(0) or I(1). In the light of consistency Pesaran et al suggests the following procedure. Test H0 based on F statistic: (a). if H0 is not rejected, proceed no further; (b) if H0 is rejected test H0: β_1 using t statistic. If this is rejected a large value of t should result confirming the existence of level relationship.

The bounds procedure is based on the assumption that the error terms are serially uncorrelated. It is therefore important that the lag order of the VAR model is selected appropriately. Hence we use Akaike's

Information criteria (AIC) for determining the lag order. As per this, regression having the lowest AIC value is selected.

The conditional long-run model can then be formed from the reduced form solution of eq.5 when the first differenced variables jointly equal zero. Once the existence of long-run relationship is confirmed and the ARDL model is applied to estimate coefficients of this long-run relation, we can derive the associated ARDL error correction model based on different lag selection criteria. In the absence of level relationship differenced regression is done to estimate short run coefficients.

For this study we are considering the case of top exporting countries of four major traded tropical products in its raw material form, namely, coffee, cocoa, tea and rubber. For coffee the top exporters are Brazil (28.30%), Vietnam (13.11%), Columbia (10.56%), Indonesia (5.88%), Mexico (3.6%) and India (3.0%) who together accounts for around 60% of total world coffee trade. In the case of tea the major exporters are Srilanka (21.36%), China (18.74%), India (13.35%), Indonesia (7.36%) and Kenya (6.49%) accounting over 67% of total tea trade. For cocoa the major exporters are Côte d'Ivoire (41%), Indonesia (15%), Ghana (12%) and Nigeria (7%) together contributing around 75% of total cocoa beans trade in 2002. In the case of rubber the major exporters are Thailand (37.94), Indonesia (27.48) and Malaysia (14.94) together contributing to 80% of total natural rubber trade.

Data Source

All data are taken from FAOSTAT 2004 and covers a period of 34 years, from 1970- 2003. Data corresponds to export quantity and export value of commodities at the raw material stage. Unit value is taken as proxy for prices. We have used Microfit for econometric analysis.

Section 4: Empirical Results

i. Coffee

Coffee, as we have already seen was regulated both at the national and International level. The reform process at the domestic level was instigated by the abandonment of International coffee agreement in 1989. Hence, the period 1970-1989 is taken as pre- reform period and 1990-2003 as post reform period. Here Dummy takes the value 0 in the pre reform period and 1 in the post reform period. The application of unit root tests shows mixed results with strong evidence of unit root only to the certain variables. As already pointed out, by using the ARDL model, it is possible to test for the existence of long run relation irrespective of whether they are purely I(0), I(1) or mutually cointegrated.

Table 1 gives values of the F statistic and t statistic for testing the existence of level relation between price and quantity for the various countries and also all the six countries taken together, which is referred as group here. The appropriate lag order chosen based on AIC criterion is given in parenthesis along the countries. In the case of India, the lag order is 3 when trend is included and 2 when trend is not included.

Among the seven groups only three show significant F statistic and within this Brazil's is significant at 10 percent level of significance, while for the other two, Vietnam and Mexico, it is significant at 5 percent significance level. For Indonesia, India and the group as such, the value of F statistic is within the critical bounds which makes decision indeterminate. In the case of t statistic, only the group came significant at 10 percent significance level. For Brazil and Mexico it is indeterminate. All the values turned out to be insignificant when trend is included in the model.

For all the countries and the group which showed significant F/t statistic along with indeterminate F/t, we assumed the existence of long run relationship and proceeded to estimate the long run values by applying

Table 1: Cointegration Results: Coffee

	F value	Critical bounds	T value	Critical bounds
		Total (1)		
With trend	3.8784	6.56;7.30	-2.528	-3.69;-3.65
Without trend	4.7578	4.04; 4.78 (10%)	-3.062**	-2.57; 2.91(10%)
		Brazil (1)		
With trend	3.0789	6.56;7.30	-2.151	3.69;-3.65
Without trend	4.837**	4.04; 4.78 (10%)	-2.900	-2.57; 2.91(10%)
		Vietnam(1)		
With trend	4.6896	6.56;7.30	-3.029	-3.69;-3.65
Without trend	5.7919**	4.94;5.73	-3.058	-2.86;-3.22
		Columbia(1)		
With trend	2.723	6.56;7.30	-2.177	-3.69;-3.65
Without trend	4.12	4.94;5.73	-2.86	-2.86;-3.22
		Indonesia (1)		
With trend	3.8653	6.56;7.30	-2.727	-3.69;-3.65
Without trend	4.4957	4.94;5.73	-2.748	-2.86;-3.22
		India (3,2)		
With trend	3.3823	4.01; 5.07	-2.522	-3.41;-4.16
Without trend	4.3425	3.79; 4.85	-2.636	-2.86; -3.53
		Mexico(2)		
With trend	4.6346	4.87; 5.85	-3.000	-3.41; -3.95
Without trend	5.9289**	3.79; 4.85	-3.433	-2.86; -3.53

Table 2: Estimates of ARDL Model: Coffee

Countries	LR β	LR ERV	SR β	SR ERV	ECM t-1
Total	-2.5362 (-1.5168)		-1.5100** (-4.2533)	-0.51	-.21433** (-2.0908)
Brazil	-1.6167** (-3.3454)	-0.61	-.89885** (-3.7847)	0.101	-.55598** (-4.2643)
Vietnam	-.15863 (-.88356)		.27182** (2.2400)	1.27	-.36565** (-2.8801)
Columbia			-0.88632** (-3.071)	0.11	
Indonesia			-0.32731 -1.007		
India			-0.55212** (-2.147)	0.45	
Mexico	.49022 (1.1019)		-.16954 (-.59536)		-.70240** (-3.4363)

the Ordinary Least Squares (OLS) to the ARDL model. We then checked the residual of the model for stationarity and found the residuals to be showing stationarity at all lags except in the case of Columbia, Indonesia and India. Hence, for Brazil, Vietnam, Mexico and the group we reject the null hypothesis of no Cointegration and for India, Indonesia and Columbia we accept the null of no Cointegration. The short run values are estimated for the first four by solving the associated ARDL Error Correction model. The significant error correction term for the above four confirms the existence of long run relation. For Columbia, Indonesia and India, which does not show any long run relation, short run values are calculated by regressing the differenced variables. The results are given in Table 2.

Column 2 and 4 gives the value of β, which gives the long run and short run coefficient of the price quantity relation. Long run and Short run ERVs are given in column 3 and 5. The error correction term is given in the last column. In none of the cases considered dummy variable came significant showing that reforms as such do not affect the price quantity relation and hence is not included in the table. Only Brazil shows significant ERV in the long run. For other countries, lagged price seems to affect export revenue rather than quantity. For Brazil in the long run and the group in the short run an increase in quantity results in 61% and 51% decline in export earnings respectively. Vietnam is the only country where export earnings increase more than proportionate to export quantity. The reason may be the unprecedented increase in exports from Vietnam from 1985 which made it reach second position in world coffee bean exports after Brazil. The coefficient of ECM shows the speed of adjustment of the short run to the long run equilibrium. For all the countries with level relation almost one quarter of error gets adjusted in the first period itself.

Table 3: Cointegration Results: Cocoa

	F statistic	Critical Bounds	T statistic	Critical Bounds
		Total (1)		
With trend	5.482**	6.56 ; 7.30	-1.681	-3.69;-3.65
Without trend	6.4816**	4.94 ; 5.73	-3.217**	-2.86;-3.22
		Cote(2)		
With trend	5.6299	4.87; 5.85	-3.035	-3.41; -3.95
Without trend	7.0724**	3.79; 4.85	-2.842	-2.86; -3.53
		Indonesia (2)		
With trend	7.7521**	4.87; 5.85	-3.210	-3.41; -3.95
Without trend	5.2168**	3.79; 4.85	-3.105	-2.86; -3.53
		Ghana(1)		
With trend	5.5993**	6.56 ; 7.30	-2.239	-3.69;-3.65
Without trend	7.8113**	4.94 ; 5.73	-2.398	-2.86;-3.22
		Nigeria (2)		
With trend	7.5298**	4.87; 5.85	-2.508	-3.41; -3.95
Without trend	7.2339**	3.79; 4.85	-2.332	-2.86; -3.53

Cocoa

Reforms in cocoa market were triggered by national causes and hence reform period differs from country to country*. For the group as a whole, 1989 is taken as the break period as ICCO stopped its economic functions in 1988. Indonesia followed a free market regime from the very beginning hence no dummy is included while estimating the ARDL model for Indonesia. Table3 gives the Cointegration results of cocoa.

All the countries show significant F statistic at 5 percent level of significance while t statistic is significant only for the group. For Indonesia the t statistic is indeterminate as it lies between the critical bounds. Assuming the existence of level relation the ARDL model is estimated for all groups and the residual is then checked for stationarity which showed it to be stationary at all lags. The results of the ARDL model are given in Table 4.

The error correction term for all the countries show significant results which further confirms the existence of long run relation. The group shows negative ERVs both in the long run and short run confirming the existence of fallacy of composition in the case of cocoa. For other countries only Ghana shows significant ERV in the long run with 18% of quantity getting reflected in export earnings. For Ivory Coast half of the increase in quantity is reflected in export earnings while for Indonesia and Ghana it is less than 50 percent in the short run. For Nigeria there is no significant relation between quantity and value.

Tea

Tea was comparatively a free market commodity and not many drastic changes have occurred in the regulatory structure in most of the

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*   Côte d'Ivoire: Pre-reform 1970 to 1991, post reform 1992-2003; Ghana 1970-1992; 1993-2003; Nigeria 1970-1985, 1986-2003; Group 1970-1988, 1999-2003.

Table 4: Estimates of ARDL Model: Cocoa

	LR β	LR ERV	SR β	SR ERV	ECMt-1
Total	-1.2544** (-4.6324)	-0.254	-1.0119** (-4.5025)	-0.0119	-.80664** (-5.8206)
Cote	-1.4843 (-1.6357)		-.47307** (-2.5655)	0.5269	-.31872** (-2.5756)
Indonesia	-.52146 (-1.8960)		-.50370** (-2.5453)	0.4963	-.34352 **(-2.7479)
Ghana	-.81114** (-3.0588)	0.188	-.60456** (-2.3560)	0.395	-.74532** (-3.5004)
Nigeria	.77106 (.86037)		-.024820 (-.14343)		-.36562** (-2.4921)

Table 5: Cointegration Results of Tea

	F statistic	Group (3) Critical bounds	t statistic	Critical bounds
With trend	4.4485	4.01; 5.07	-2.729	-3.41;-4.16
Without trend	5.7043**	3.23; 4.35	-2.845	-2.86; -3.78
		Srilanka (4,2)		
With trend	5.0179**	3.47; 4.57	-3.024	-3.41; -4.36
Without trend	4.8969**	3.79; 4.85	-2.511	-2.86; -3.53
		China(4,1)		
With trend	2.2764	3.47; 4.57	-1.977	-3.41; -4.36
Without trend	5.931**	4.94 ; 5.73	-1.681	-2.86;-3.22
		India (4)		
With trend	5.2182**	3.47; 4.57	-3.197	-3.41; -4.36
Without trend	7.009**	2.86; 4.01	-3.702	-2.86; -3.99
		Indonesia (4)		
With trend	9.2128**	3.47; 4.57	-4.195	-3.41; -4.36
Without trend	7.7199**	2.86; 4.01	-3.633	-2.86; -3.99
		Kenya (4)		
With trend	7.4429**	3.47; 4.57	-3.825	-3.41; -4.36
Without trend	7.5946**	2.86; 4.01	-3.841	-2.86; -3.99

producing countries. Kenya is an exception where Kenya Tea Development Agency Ltd and tea board controlled the marketing. Now Kenya tea industry is fully liberalised and marketing is independently carried out by traders. We are taking the break period as 2000 when Kenya Tea Development Agency Ltd which controlled tea market was privatized. For other countries and group no dummy is included. Table 5 gives the Cointegration results.

All the F statistics are significant except for the group when trend is included, which is indeterminate. Regarding t statistics none of them are significant, but many are indeterminate which are given in italics. We estimated the long run values by applying the Ordinary Least Squares (OLS) to the ARDL model and checked the residual of the model for stationarity. Residuals showed stationarity at all lags except in the case of China for which we estimated the short run ERVs by regressing the differenced variables. The ARDL models are estimated for all countries and group with trend and without trend. For group, model is estimated without trend as it is found to be more appropriate. The results are given in Table 6.

In none of the cases concerned β is significant. A change in quantity does not significantly affect price thus rejecting the root cause of fallacy of composition. Reform process has no significant effect on Kenya export price.

Rubber

Rubber market was regulated through buffer stock operations carried out by International Rubber Council, while in the major producing countries private agents carried out the operations. International Rubber Agreement (IRA), which started its operation in 1979, was fairly successful in maintaining price stability. Hence, while determining the break period we consider the IRA which ceased its operation in 1999. Period from 1970- 1998 is considered as pre-reform period and 1999-

Table 6: Estimates of ARDL Model for Tea

Countries	LR β_2		SR β_2		ECM t-1	
	With trend	Without trend	With trend	Without trend	With trend	Without trend
Total		-.021040 (-.05225)		.68152 (1.7705)		-.38916** (-3.0196)
Srilanka	-.044440 (-.13797)	.30089 (.95936)	.27453 (1.5434)	.13097 (.89907)	-.51929** (-3.5418)	-.43529** (-3.5616)
China				0.13670 (0.744)		
India	.71100 (.98945)	.65887 (.97745)	.26356 (1.0617)	.23824 (1.1116)	-.37069** (-3.0066)	-.36159 (-3.1815)
Indonesia	-.10802 (-.29232)	-.46785 (-1.4532)	-.05641 (-.3018)	-.21407 (-1.6960)	-.52222** (-3.4874)	-.45756** (-3.2842)
Kenya	.16239 (.52712)	.067116 (.51502)	.088701 (.52584)	.036937 (.49414)	-.54621** (-3.4637)	-.55034** (-3.5610)

2003 post reform period. The Cointegration results of rubber is given in Table 7.

Table 7: Cointegration Results Rubber

	F	Critical bounds	T statistic	Critical bounds
		Thailand (1,2)		
With trend	6.2182	6.56;7.30	-3.441	-3.69;-3.65
Without trend	6.1595**	3.79; 4.85	-3.061	-2.86; -3.53
		Malaysia (2)		
With trend	6.8525**	4.87; 5.85	-3.665	-3.41; -3.95
Without trend	4.5738	3.79; 4.85	-1.891	-2.86; -3.53
		Indonesia (2)		
With trend	3.8589	4.87; 5.85	-2.778	-3.41; -3.95
Without trend	5.9436**	3.79; 4.85	-2.901	-2.86; -3.53
		Total		
With trend	4.7048	4.87; 5.85	-2.869	-3.41; -3.95
Without trend	7.235**	3.79; 4.85	-2.931	-2.86; -3.53

F statistics came significant when trend is not included for Thailand, Indonesia and the group while in the case of Malaysia; it came significant when trend is included. For none of the countries t statistics came significant, but in many cases it is indeterminate. Hence we estimated the associated ARDL model and checked for stationarity of residuals which proved to be significant. The significant error term also strengthened the existence of long run relationship. The results of ARDL model are given in Table 8.

Table 8: Estimates of ARDL Model for Rubber

Countries	LR β_2	LR ERV	SR β_2	SR ERV	Dummy	ECM t-1
Thailand	.18170 (1.2668)		.094844 (1.1215)			-.52197** (-3.0760)
Malaysia	.57600 (1.1201)		1.4571** (3.4693)	2.46	-.44933** (-2.4275)	-.56650** (-3.5198)
Indonesia	.29184 (.43300)		-.98800 (-1.8856)			-.38020** (-2.2575)
Total	.22996 (.24064)		1.4817** (2.3404)	2.48		-.38978** (-2.3817)

In the long run there is no significant relation between price and quantity, while in the short run; there exist a significant relation for Malaysia and the group. For both an increase in quantity has resulted in a more than proportionate increase in export earnings thus invalidating the existence of adding up problem. Reform process came significant in the case of Malaysia.

Thus, on the whole, fallacy of composition is present in the case of coffee and cocoa with both showing a serious adding up problem whereby an increase in quantity results in a decline in export earnings when the group is concerned. In the case of tea and rubber fallacy is non existent when we consider the major exporters. In the case of coffee and cocoa which faces adding up problem, reforms measures came insignificant showing that reform as such does not lead to adding up problem. Certain inferences can be drawn from this analysis of fallacy of composition.

- Adding up problem is more rampant in the case of those commodities on which a large number of countries are dependent for foreign exchange and employment. Again, it is acute in the case of those countries which are heavily dependent on one or two commodities for foreign exchange as well as employment. Table 9 gives a better exposition of this idea.

A major share of commodity dependent countries is dependent on either cocoa or coffee for their foreign exchange. Most of them belong to the category of heavily indebted countries and least developed countries. Almost all of the heavily commodity dependent countries considered in our analysis showed a negative relation between price and quantity exported so that the revenue is affected significantly.

- Adding up problem is rampant in the case of those countries which underwent drastic changes in the domestic commodity market. But the reform turned insignificant in explaining this except in

Table 9: Countries Dependent on Tropical Products for Export Earnings

Commodities	50 percent or above of export earnings	Between 25-49 percent of export earnings	Between 10-24 percent of export earnings	Between 5-9 percent of export earnings
Coffee	*Burundi*	*Ethiopia*	Guatemala, *Rwanda* Honduras, *Uganda,*	Columbia, Côte d'Ivoire, *Nicaragua*
Cocoa		Côte d'Ivoire, *Sao Tom and Principe, Ghana*		Cameroon
Tea			Srilanka, *Rwanda,* Kenya	
Rubber				

Source: FAOSTAT

Note: Countries Underlined: Heavily Indebted Poor Countries

In Italics: Least Developed countries as per UNCTAD 2002 Handbook of Statistics

the case of rubber which does not face adding up problem. This might be due to the inability of the government intervention in the pre reform era to effectively regulate the market. In most of the cases, state intervention was withdrawn without developing proper institutions to carry many of the functions earlier performed by the state. This was true mostly in the case of commodity market in Less Developed Countries in Africa. In most of the cases state just withdrew from the functions and opened the market to the private players. On the other hand, tea and rubber which were more or less free market commodities private players were allowed in the market and state acted more as a facilitator than a mere promotional organisation.

In short, the backwardness of the commodity dependent countries along with the lack of proper institutional structure even after the reforms resulted in adding up problem in the case of tropical commodities.

Summary and Conclusion

This paper examined the effect of commodity market liberalisation focusing on the adding up problem. It tried to examine how far the differences in reforms affect adding up problem by taking the case of four tropical commodities. Among the four commodities; coffee and cocoa, have undergone drastic reforms and are heavily relied upon for foreign exchange in majority of producing countries. For the other two commodities reforms were more subtle as private participation were already allowed in majority of the producing countries. Dependency is also less in the latter case. It was found that Adding up problem is prevalent in the first case while in the latter it is absent. Hence we come to the conclusion that product specificities like inelastic demand and supply does not necessarily result in adding up problem. What matters more are the extent of commodity dependence and the underdevelopment of the institutions in the producing/exporting countries.

The results stress the need to revisit the reforms in commodity market. In most of the cases reforms were introduced as panacea for all inefficiencies without examining the real problem. It failed to take into account the heavy dependence on certain commodities for foreign exchange as well as employment by the producing countries. In many cases fall back option is virtually absent which make it imperative to produce more to cope up with the declining prices. The alternative often suggested by the reformers is diversification. But unfortunately diversification is made to equally demand inelastic product by the countries and the vicious circle continues. A way out of this calls for moving up the processing chain where demand is more elastic and reducing the commodity dependence. All this again boils down to the need for proper institutions and an active role by the state in regulating the institutions.

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