UNIVERSITA' DEGLI STUDI DI TRENTO - DIPARTIMENTO DI ECONOMIA

VALUE CHAIN ANALYSIS AND MARKET POWER IN COMMODITY PROCESSING WITH APPLICATION TO THE COCOA AND COFFEE SECTORS

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Abstract

Value chain analysis extends traditional supply chain analysis by locating values to each stage of the chain. This can result in a "cake division" fallacy in which value at one stage is seen as being at the expense of value at another. Over the past three decades, the coffee and cocoa industries have witnessed dramatic falls in the producer (i.e. farmer) share of the retail price. Both industries are highly concentrated at the processing stage. Nevertheless, developments in the producer and retail markets are largely unconnected and there is no evidence the falls in the producer shares are the result of exercise of monopoly-monopsony power. The explanation of declining producer shares is more straightforward – processing, marketing and distribution costs, incurred in consuming countries, have tended to increase over time while production costs at origin have declined.

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1. Introduction

This paper has both a methodological and a substantive agenda. At the methodological level, I examine the potential contribution of Global Value Chain (GVC) analysis in the commodity sector. Substantively, I aim to resolve the apparent paradox that retail coffee and chocolate prices have declined at most modestly over the past three decades while producer prices for coffee and cocoa have fallen more dramatically. This has resulted in substantial falls in the producer shares of retail prices. Some commentators see these declines in producer share as the result of exercise of monopoly and monopsony power in processing industries which should high levels of concentration.

The term "global value chains" appears to be originally due to Hopkins and Wallerstein (1977, 1986, 1994) who proposed to analyze a sequence of processes culminating in the production of the final product. This endeavour was in part motivated by the realization that many industrial goods are processed in multiple countries prior to final retail sale, and that trade in intermediate products has become a major component of all international trade. Industrial products typically combine a number of different raw material and other inputs – GVC analysis looks at the value contribution of each of these to the final product.

Production processes for many traditional tropical agricultural products are often much less complicated. In some cases, the retail product may appear to be little more than a repackaging of the raw material input. Roast coffee appears to conform to this paradigm. In cases such as these, GVC analysis simply extends traditional supply chain analysis by locating values to each stage of the chain.

GVC analysis is a framework, not a hypothesis. It therefore lacks substantive implications. According to its proponents, it is well-adapted for posing particular classes of question, arguably neglected in traditional economic analysis, rather than others, more favoured by traditional analysis. In particular, GVC analysis has been used to analyze the geographical, often international, distribution of activities and value creation in the production of a final good – see, for example, Korzeniewicz and Martin (1994). In this respect, GVC analysis links to the contemporary discussion in international economics of the extent of and effects of outsourcing – see Feenstra and Hanson (1996, 1999). Its major shortcoming is that it invites interpretation of changes in value shares as measuring the incidence of changes in market power, an interpretation which is only valid in particular circumstances. In particular,

GVC discussions can be prone to a "cake division" fallacy in which value at one stage is seen as being at the expense of value at another. To be useful, the GVC framework needs to be complemented by more tradition industrial organization models in which questions of market power can be more satisfactorily addressed.

It is perhaps fair to say that many applications of GVC analysis to tropical agricultural commodity markets have been polemical rather than scholarly. Agricultural commodity prices have tended to be low over the two decades in which GVC analysis has been under development, and the primary purpose of many GVC contributions in this sector has been to lament the low share of the value of final products received by developing country farmers (Oxfam 2002a, 2002b; Daviron and Ponte, 2005). These low producer shares are presented as posing an ethical problem, but the absence of causal structure makes it difficult to discuss the origin of the changes in value share and therefore to consider policies which might alleviate the position in which the farmers find themselves.

I illustrate these issues by reference to the world coffee and cocoa industries. Coffee and cocoa are both tropical tree crop commodities produced largely (cocoa) or substantially (coffee) by smallholder farmers. A number of countries (most importantly Brazil, Côte d'Ivoire and Indonesia) are important producers of both crops. Marketing arrangements are similar. Coffee has the merit that the value chain is relatively simple while, at the same time, there is considerable concentration at the processing stage giving rise to the potential for the exercise of monopoly and monopsony power. Coffee prices were very low during the so-called Coffee Crisis years of 1999-2003. The cocoa industry is more complicated because the final product, chocolate, exhibits greater variety than roast and soluble coffee, and because chocolate incorporates other raw material inputs. Price fluctuations over recent decades have been less extreme than in coffee. However, cocoa processing ("conversion") is as or more concentrated than coffee roasting.

In both industries, it has been suggested that market concentration has allowed value to be appropriated by multinational processing companies at the expense of developing country farmers and that this was one of the factors underlying the Coffee Crisis. I argue that there is no merit in this argument. In particular, there is no evidence that the margins in either cocoa or coffee processing have risen over time. This is not to imply an absence of monopoly or monopsony power, but only that one cannot explain a loss of producer share through an

increase in market power. Instead, the decline in the producer share of the retail coffee price is the fact that only around one half of the costs underlying retail coffee prices are attributable to the fob price of coffee. The proportion of chocolate production costs attributable to cocoa is even lower. The remaining costs are incurred in consuming countries. Productivity gains have reduced coffee production costs but coffee processing and distribution costs have risen, at least until the start of this decade. The result is that retail coffee and chocolate prices have only fallen modestly implying a decline in the producer shares of the retail price.

The structure of the paper is as follows. Sections 2 and 3 respectively describe the coffee and cocoa supply chains. Section 4 sets out an accounting framework for GVC analysis and section 5 builds on this framework to develop a simply GVC model. The model does not have predictive power but amounts instead to an analytical device for understanding changes in value shares. Sections 6 and 7 set out the facts in relation to the evolution of producer value shares in the coffee and cocoa industries respectively over the past three decades. Sections 8 (the statistical framework), 9 (the producer coffee and cocoa markets) and 10 (the retail coffee and chocolate markets) apply the analytical framework developed in section 5 to explain these observations. Section 11 concludes.

2. The Coffee Supply Chain

Coffee is a tropical tree crop commodity. There are two principal tree varieties – arabica and robusta – the beans from which give coffees with very different characteristics. Robusta coffees, which are grown at low altitudes, have less flavour but greater strength than arabicas, which are grown at higher altitudes and often on volcanic soils. To further complicate matters, arabica beans can either be wet or dry-processed. Wet processing, used throughout the Spanish speaking Americas and in most of East Africa, results in mild Arabica coffee which is ideally suited to filter coffees. Dry processing, which is the standard practice in Brazil and Ethiopia, gives a more bitter coffee which is particularly-suited to the preparation of espresso. Arabica is more difficult to grow and prepare than robusta, and quality variations are much more considerable. Some high quality arabicas fetch large market premia, in particular from the speciality coffee retailers. By contrast, most major roasters blend coffees from different origins in order to obtain a quality which is consistent over time. The blends typically use arabica for flavour with robusta as a filler, the relative proportions of the two determining the overall cost of the blend.

Coffee is produced both by smallholders and on large farms and estates. Estates are particularly important in Latin America but also in Kenya. Most of the remainder of African production is from smallholders.

Coffee processing firms are called roasters. Roasters sell directly to retailers (supermarkets and bars or restaurants). The retail product may either be in the form of roasted coffee (beans or as ground coffee) or as soluble (instant) coffee. There are two technologies for the production of soluble coffee – spray drying, which is low cost but results in considerable loss of flavour, and freeze drying, which conserves flavour but is more costly and requires access to proprietal technology. Figure 1 illustrates the simplest case in which farmers sell (often via cooperatives or local buyers) either to independent exporters or to exporters owned or controlled by multinational exporters.

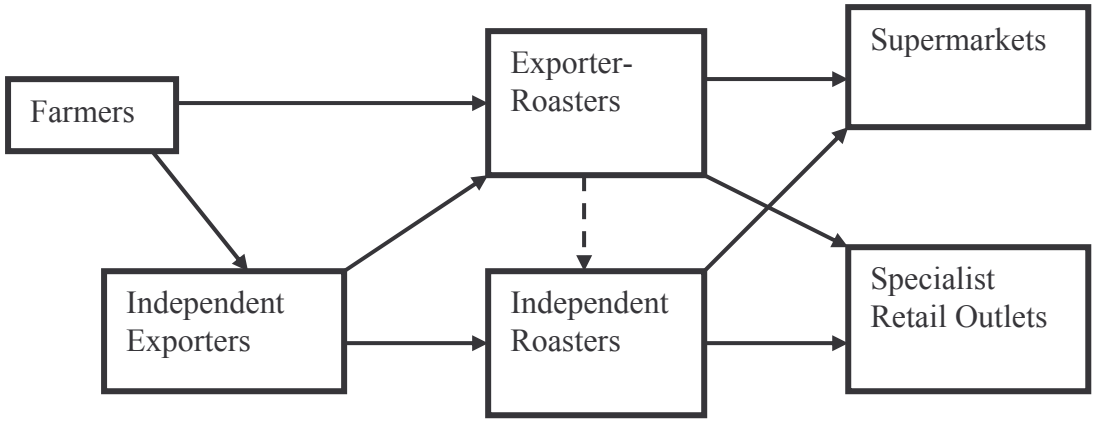

Figure 1: The Basic Coffee Supply Chain

The two principal variants of the structure illustrated in Figure 1 arise in certain Latin American countries, most notably Colombia, where a parastatal (or state supported) roaster competes with the multinational exporter roasters, even to the point of selling directly to supermarkets and through specialized outlets; and the East African structure in which all, or almost all, sales for export pass through a national coffee auction (Kenya and Tanzania).

Coffee roasting is a concentrated activity. In 1998, the two largest roasters accounted for 29% of total world coffee roasting, and the top six roasters[1] for 60% (van Dijk *et al*., 1998). This concentration is principally the result of branding. Heterogeneity among coffee varieties and across origins allows roasters to produce differentiated products geared to tastes in specific markets and specific market sectors. Brands are often heavily promoted and this gives rise to a barrier to market entry. Economies of scale are important only in the production of soluble coffees.

The coffee market has been controlled for much of the post Second World War period, most notably by the sequence of International Coffee Agreements (ICAs). The first ICA was negotiated in 1962. It and the succeeding three agreements limited exports to keep prices at levels deemed fair to both producers and consumers. Intervention ended in July 1989. Gilbert (1996, 2004), who follows Law (1975) in describing the ICAs as "internationally sanctioned cartels", concluded that the agreements both raised coffee prices but had little effect on variability. Subsequent to the breakdown of coffee controls, the coffee market has seen two extended periods of low prices. The first, from 1989-93, resulted from the release onto the market of producer inventories, previously held back by ICA export restrictions, while the second, from 1999-2002, was the consequence of large production increases in Brazil and Vietnam against a backdrop of slow consumption growth – see Gilbert (2005).

3. The Cocoa Supply Chain

Cocoa is a tropical tree crop produced almost entirely by smallholder farmers under competitive conditions. Cocoa processing consists in the production of two intermediate products, cocoa butter and cocoa powder. This operation is known as converting (or grinding) and the firms which do this are the converters (or grinders). Cocoa butter and powder are recombined, in varying proportions, to make chocolate which also incorporates other inputs –most importantly milk and sugar. Cocoa powder is also used without the butter in confectionary products. Butter and powder are produced in fixed proportions, given the fat content of the beans, and powder is normally seen as a by-product. Cocoa butter is highly homogeneous and, once processing has taken place, origin is at most a minor consideration.

[1] Now reduced to five through mergers: Altria, Nestlé, Proctor and Gamble, Sara Lee and Tchibo.

A simplified version of the cocoa supply chain is illustrated in Figure 2. Developing country farmers sell their cocoa beans (perhaps indirectly via a cooperative and/or a local buyer or *traitant*) to en exporter. In many producing countries, some or all of the largest exporters will be either the multinational converters themselves or local companies controlled by the converters. Once shipped to Europe or North America, the beans will be converted to cocoa butter (destined for chocolate) and cocoa powder (used in the confectionary industry). The large converters are not involved in chocolate manufacture, but some large chocolate manufacturers may have conversion capacity and so be able to buy directly from exporters. (Figure 2 shows less important links as broken arrows). Otherwise, exporters will find themselves selling to the major converters, often prior to shipping. Chocolate is sold both through supermarkets and through smaller specialist outlets. A small amount of (generally low quality) cocoa may be processed locally but it is costly to export the butter which is therefore sold locally.[2]

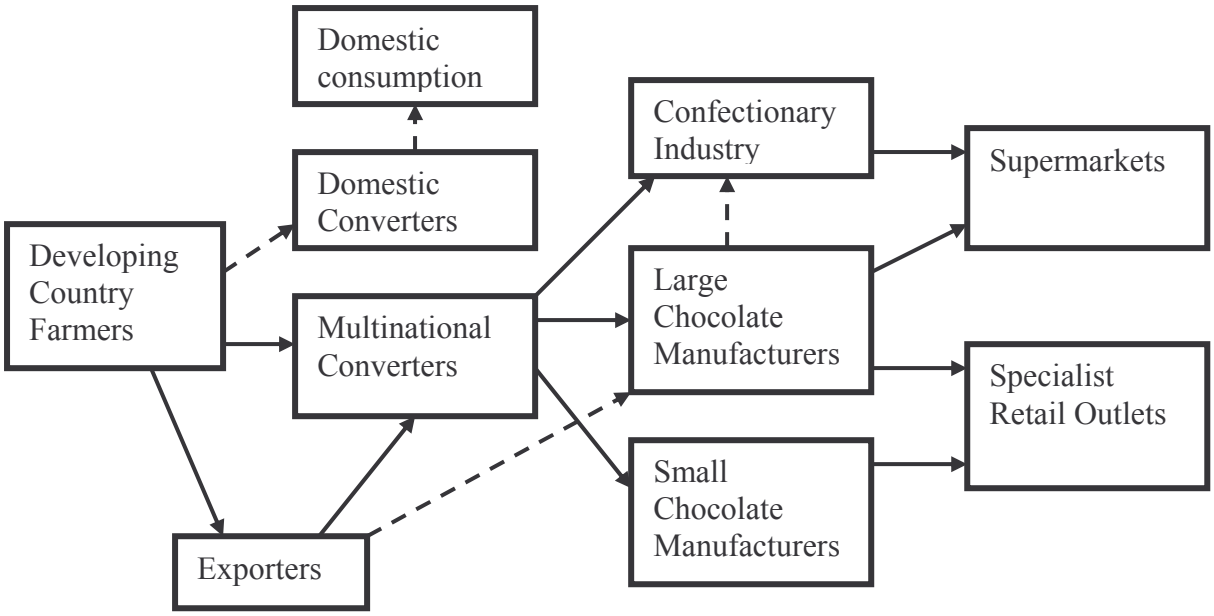

Figure 2: The Cocoa Supply Chain

We turn now to industrial structure. With a few important exceptions, the cocoa markets in the producing countries are free and competitive either because they have always been this way or because or recent moves to liberalize tropical agricultural markets. By contrast, converting exhibits massive economies of scale both in the conversion process itself and in transportation. Figure 2 underlines the pivotal position of the converters in the cocoa value

[2] In Ghana, the second largest cocoa producer and exporter, the Cocoa Marketing Board (Cocobod) is a monopsony buyer. Cocobod exports either directly or through major exporters. Figure 2 omits the cocoa terminal markets which are used primarily for paper transactions.

chain. The conversion industry is highly concentrated. Four large oligopolists dominate the industry – ADM, Barry Callebaut, Cargill and Hosta. These big converters do not manufacture chocolate, and the two most important – ADM and Cargill – see themselves primarily as trading companies. The chocolate industry is much less concentrated. Chocolate producers have the choice between buying butter and powder from an independent converter or buying beans and undertaking the conversion themselves. Traditionally, they have opted for the latter route but increasingly they are moving towards purchase of butter and powder from the major converters.

4. The Accounting Framework

To move from a supply chain to a value chain we need to attach values to each stage in the supply chain. A prerequisite for doing this is an accounting framework. Simple value share discussions often appear to be based on the identity:

retail price of processed coffee = producer price of coffee + gross margin

or
$$p = \pi + m \tag{1}$$

Within this structure, the producers' value share is just $\omega = \frac{\pi}{p}$.

It is obvious but not always made explicit that the producer price π of a commodity is at most an upper bound on the return obtained by the producer. The production of many commodities requires inputs and these can account for a large proportion of the price the farmer receives. Production may also involved hired labour inputs. Finally, there the opportunity cost to the labour that the farmer and his family provide. The farmer's net return is likely to vary across commodities and producing countries depending on the importance of these various factors. It is not clear a priori that one should expect a very strong relationship between the gross producer shares implied by identity (1) and the net returns obtained by the producers, which is presumably our ultimate concern.

Suppose that we are nevertheless happy to interpret the producers' value share ω as implied by identity (1) as a measure of producer welfare. Does it follow that a decline in this share is due to the exercise of monopoly or monopsony power? The accounting identity (1) aggregates the processors' profit margin with processing and intermediation costs in the same way that it includes input and labour costs in the producers' gross receipts. For other

commodities, such as cocoa, other raw material inputs (milk, sugar) may be as or more important than the cocoa input.

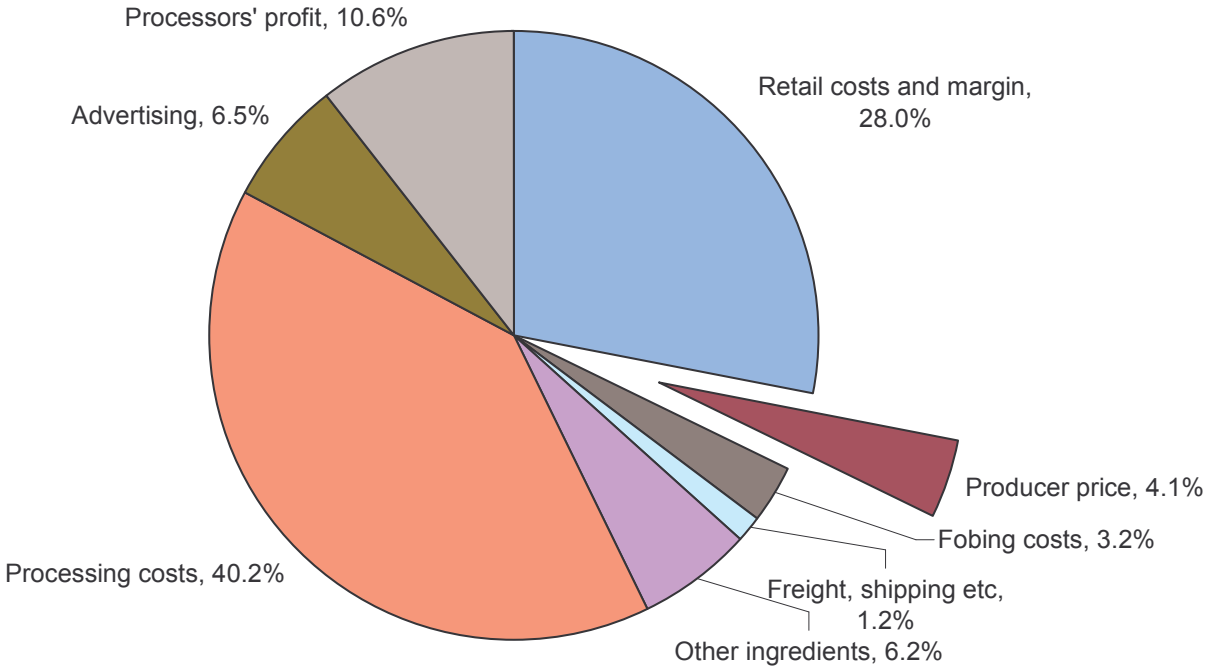

Figure 3: Indicative Cost Breakdown, U.K. Milk Chocolate, 2004

Figure 3 shows an indicative cost breakdown for U.K. milk chocolate in 2004.[3] Milk chocolate is made from milk and sugar in addition to cocoa. The cocoa producer is seen as obtaining only 4% of the final retail price. Total raw material costs (including transport etc.) are estimated as 14.7% of the retail price. Processing and retail costs are responsible for the largest share of the total (40.2% and 28.0% respectively). A more complete framework which can accommodate this degree of complexity is the following:

$$\begin{aligned} \textit{retail price of processed product} = [&\textit{commodity producer price} \\ &+ \textit{internal transportation and other fobbing costs}]/\textit{exchange rate} \\ &+ \textit{cif-fob margin and other export costs} \\ &+ \textit{costs of other raw material inputs} \\ &+ \textit{processing cost} \\ &+ \textit{processing margin} \\ &+ \textit{advertising cost} \\ &+ \textit{retail costs and margin} \\ &+ \textit{sales or value added tax} \end{aligned} \tag{2}$$

GVC analysis tends to ascribe much of the variation of the producer value share ω to changes in the processing margin which reflect, in part, changes in processors' monopoly power.

[3] Source: confidential (private communication).

Identity (2) emphasizes that many other factors can contribute to changes in producer value shares. Trade liberalization can affect the cif-fob margin.[4] In particular, market liberalization should lower processing and fobbing costs – see Akiyama (2001) and Varangis and Schreiber (2001) for the effects of coffee and cocoa market liberalization respectively.

5. An Economic Framework for GVC Analysis

In order to discuss the economic determinants of changes in value shares, we need to embed the GVC concept in a simple economic framework. I use the most simple possible linear supply and demand framework.

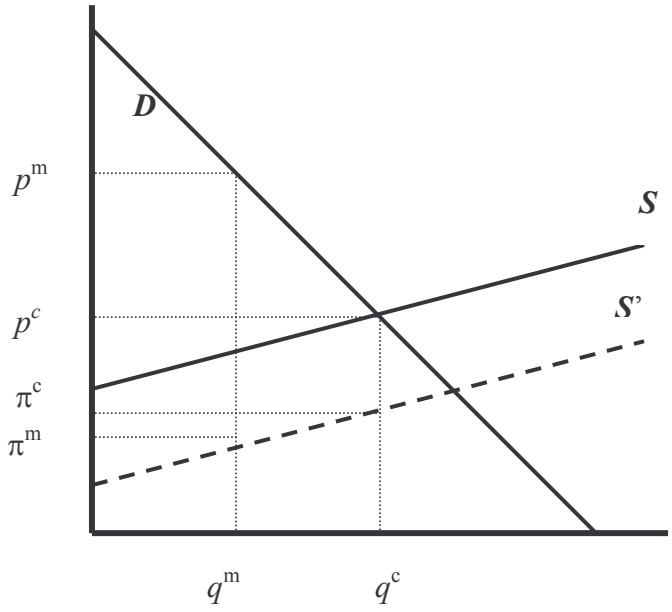

Figure 4: The GVC Decomposition in a Simple Supply-Demand Model

In Figure 4, demand for the processed product, price p, is given by the demand function D. S' is the supply function of the commodity raw material, price π. There is a constant processing cost c which is common to all firms (and which includes the processing margin and retail costs and margin). There is no quantity loss in processing and, in this simple example, no other raw materials are used. This implies a competitive supply function S for the processed product which satisfies the equation $p = \pi + c$. Under competition, production is q^c with commodity price π^c and processed good price p^c. As we have seen, however, commodity

[4] Exchange rates pose a further issue. The first two terms on the right-hand side costs in identity (2) while the remaining terms and the left hand side are in the currency of the consuming country. If exchange rate changes are not fully and immediately reflected in both producer and retail prices, the producers' value share will exhibit some exchange rate dependency..

processing tends to be concentrated and processing firms have monopoly power. This will imply a lower level of production q^m with commodity price π^m and processed good price p^m. Conditional upon this reduction, the product price rises from p^c to p^m while the commodity price falls from π^c to π^m. The extent to which the product price is high is governed by the slope of the demand curve *D*, while the extent to which the commodity price is depressed depends on the slop of the supply curve *S*'.

In what follows, I consider two value share measures: the producer's value share of the final retail price $\omega = \frac{\pi}{p}$ and $\sigma = \frac{\pi}{f}$, the producer's share of the fob price *f*. The two measures are related through the identity

$$\omega = \frac{\pi / f}{p / f}. = \frac{\sigma}{1+\mu} \tag{3}$$

where μ is the processor's gross margin over the fob price.

The appendix sets out a formal model for the determination of these three ratios in both a competitive and a oligopoly-oligopsony market structure. Here, I illustrate the model by considering a simple example. I suppose the demand function

$$Q = 125 - \tfrac{1}{4} p \tag{4}$$

and the supply function

$$Q = 2\pi \tag{5}$$

I take both pre- and post-fob costs to be 25 (i.e. $c = k = 25$) and, in the oligopolistic case, suppose that the number *n* of firms is 4. The processor's net margin $\nu = \mu - \frac{k}{f}$. Consumer surplus, the standard measure of consumer benefit from consumption of a good, is measured by the area under the demand curve:

$$CS = \frac{1}{2}\left(\frac{\alpha}{\beta} - p\right)Q \tag{6}$$

Table 1 gives the outcomes. In this example, the supply elasticity is unity while the demand elasticity rises from 0.25 in the competitive case to 0.56 in the oligopolistic case. Since demand is less elastic than supply, the effects of the oligopolistic restriction of output is greater on the retail price than on the producer price, as illustrated in Figure 4. Oligopoly

halves the producer share of the retail price from 50% to 22.2%, but most of this impact comes from the higher retail price – the producer share of the fob price declines marginally from 66.7% to 66.1%. The actual decline in the producer price, presumably what matters to the farmers, is 20%, from 50 to 40. The massive fall in the producer share of the retail price confuses the issue by exaggerating the possible price for which farmers might look, while their share of the fob price "flushes out the baby with the bath-water" since both numerator and denominator of the ratio are affected in the same way. In the end, it is always better to consider prices than shares.

Table 1
Results – Base Case

		Competition	Oligopoly
Quantity	Q	100	80
Retail price	p	100	180
Fob price	f	75	65
Producer price	π	50	40
Producer share of retail price	ω	50.0%	22.2%
Producer share of fob price	σ	66.7%	61.5%
Processor gross margin	μ	33.3%	176.9%
Processor net margin (profit)	ν	0.0%	138.5%
Consumer surplus	CS	20,000	12,800

We may use this framework to consider a number of scenarios. I consider the following:

a) market liberalization, resulting in a fall in pre-fob costs c from 25 to 20;
b) technological advance in processing, resulting in a fall in post-fob costs k from 25 to 20;
c) an increase in labour costs in the consuming country unmatched by productivity advance, resulting in a rise in post-fob costs k from 25 to 30;
d) an increase in concentration at the processing stage, modelled as a fall in the number n of firms from 4 to 3;
e) increased advertising, modelled as a fall in the slope β of the demand curve from 0.25 to 0.20, together with a fall in the intercept α from 125 to 120.[5]

[5] The fall in α ensures that prices and quantity in the competitive equilibrium is unaffected by the change in the slope β.

Table 2 Results – Variations						
	Base Case	**(a) Market Liberal-ization**	**(b) Techno-logical Advance**	**(c) Increased Wages**	**(d) Increased Concent-ration**	**(e) Increased Advertising**
Quantity *Q*	80.0	80.9	80.9	79.1	75.0	80.0
Retail price *p*	180.0	176.4	176.4	183.6	200.0	200.0
Fob price *f*	65.0	60.4	65.4	64.6	62.5	65.0
Producer price π	40.0	40.4	40.4	39.6	37.5	40.0
Producer retail share ω	22.2%	22.9%	22.9%	21.5%	18.8%	20.0%
Producer fob share σ	61.5%	66.9%	61.8%	61.3%	60.0%	61.5%
Processor gross margin μ	176.9%	191.9%	169.6%	184.3%	220.0%	207.7%
Processor net margin ν	138.5%	150.6%	139.0%	137.9%	180.0%	169.2%
Consumer surplus *CS*	12,800	13,086	13,086	12,517	11,250	16,000

Results, taking the second column of Table 1 as the base case, are summarized in Table 2.

a) Producers gain little from market liberalization. The 25% reduction in pre-fob costs from 25 to 20 only raises the producer price by 1%, from 40.0 to 40.4. The long term incidence of cost reductions in the commodity industries is on consumers (consumer surplus rises by 2.2%) and processors rather than producers – see Gilbert and Varangis (2004).[6]

b) A reduction in processing costs has the same impact on prices and quantities as the same reduction in pre-fob costs. The only difference is in the fob price itself. Again, the incidence is primarily on consumers. The small rise in the producer share of the retail price is the same in both cases, but in the case of technological advance farmers see a sharp fall in his share of the fob price despite the fact that they are unambiguously better off as the result of the advance.

c) An increased in labour costs in the consuming countries has the opposite impact of productivity advance in processing and distribution. The producer share of the retail price falls but there is little impact on the producer share of the fob price.

[6] Oxfam (2002, p.21) appears to assert that market liberalization may actually worsen the position of farmers: "However, the impact of ill-imposed liberalization on international prices often negates any short-term positive benefit to farmers." This statement is only correct if "negates" is translated as "partially offsets".

d) Increased market concentration pushes up the retail price, in this instance by 11.1%, and also depresses the producer price, here by 6.7%. The producer share of the retail price falls by 3.4% but, because the cost wedge between the fob and producer prices remains fixed, the producer share of fob falls by 6.1%.[7]

e) In the example chosen, the increase in advertising leaves output unchanged from the base case but allows the producer to charge a higher retail price. The unchanged output implies unchanged levels for the fob and producer prices. The producer share of the retail price therefore falls while its share of the fob price remains constant. There is a substantial rise in consumer surplus, essentially because advertising results in consumers putting a higher evaluation on intra-marginal units of consumption. Perhaps paradoxically, advertising is seen as benefiting consumers far more than it does producers.

Overall, the value share measures tend to confuse rather than illuminate the changes in the situation of the producers. In particular, comparison of the producer price with the retail price can result in a fall in the value share despite an unchanged producer price (the case of increased advertising).

Sections 6 and 7 present evidence that the producer share of the retail price has fallen for both coffee and cocoa producers over the past three decades. In sections 8-10, I demonstrate that this is due almost entirely to a rise in the margin of retail coffee and chocolate prices over fob coffee and cocoa prices and that producer shares of fob prices have tended to rise rather than fall in both industries. I suggest that these findings may be explained by two factors:

- The principal explanation of the rise in the margin of retail prices over fob prices is the rise in labour costs in consuming countries unmatched by productivity increases – case (c) in Table 2.
- By itself, this latter factor would tend to decrease the producer share in the fob price – see Table 2. In many producing countries, that reduction has been offset by the effects of market liberalization and reduced export taxation.

[7] Discussing the cocoa market, Oxfam (2002, p.5) states, "The fact that processing is controlled by powerful multinationals … means that corporations can use monopolistic buying practices to artificially inflate prices. This in turn reduces demand for cocoa … and exerts a downward pressure on producer prices."

The overall effect is to generate a rising producer share in fob prices coincident with a decline in the producer share of retail prices.

6. The Producers' Value Share in Coffee

There have been a number of applications of GVC analysis to the coffee market – see in particular Talbot (1997) and Daviron and Ponte (2005). Some of these analyses have been provoked by a feeling of crisis in the industry resulting from low market prices, first in the early nineteen nineties in the immediate aftermath of the ending of coffee controls, and more latterly over the period 1999-2002 when prices again became very low. With specific reference to this later period, Oxfam (2002b) asserted that coffee farmers were averaging 5% of the value of retail coffee. By contrast, Talbot estimates producers' share of final value to have been around 20% over the period in which the ICAs remained economically active.

The decline in the producer share in value added over the post-ICA period is taken as implying that the market process has been unfair. Daviron and Ponte (2005, p.123), for example, state that "the proportions of generated income were relatively fairly distributed between consuming and producing countries" under the ICA regime, but that, starting from the 1990s, farmers have been "squeezed" (*ibid*, p. 209) with the result that value has been "transferred from farmers to consuming-country operators" (*ibid*, p. 246). It is undeniable that the majority of smallholder coffee farmers have not obtained satisfactory returns over much of the past fifteen years, while the roasters have enjoyed much greater prosperity. The danger with discussions which adopt the cake division analogy can give a misleading impression that the prosperity of the processors is a cause of the difficulties experienced by the farmer. We saw in section 5 I that exercise of monopoly or monopsony power is only one of a number of factors which can result in changes in the producers' value share.

In what follows, I look at the producers' value shares for five major arabica producing countries (Brazil, Colombia, Guatemala, Kenya and Tanzania) and five major robusta producers (Brazil, Côte d'Ivoire. Indonesia, Uganda and Vietnam). In each case, I compare the producer price in the producing country to the retail price of coffee in the United States. All prices are measured in U.S. dollars.[8] Table 3 gives the value shares for the Arabica producers and Table 4 for the robusta producers.

[8] Source: International Coffee Organization.

Table 3 Value Shares for Arabica Coffee Producers, 1980-2005						
	Brazil	**Colombia**	**Guatemala**	**Kenya**	**Tanzania**	**Average**
1980-88	27.3%	27.4%	37.4%	43.6%	35.9%	34.3%
1989-2005	22.6%	23.4%	21.1%	27.0%*	16.5%	22.1%
1989-93	28.1%	22.6%	18.9%	18.4%	16.8%	20.9%
1994-98	21.6%	27.2%	24.3%	40.9%	22.3%	27.2%
1999-2003	17.6%	20.0%	18.4%	22.3%	12.7%	18.2%
2004-05	23.7%	24.3%	25.9%	24.9%**	10.6%	21.7%
The table gives the producer price for coffee beans as a share of the U.S. retail price of coffee. All prices are measured in U.S. dollars. The final column gives a simple average of the five country shares. Years are calendar years. Source: ICO * Kenya: 1989-2004, ** Kenya: 2004						

In each case, I compare the producers' value shares in the final decade of ICO controls (row 1) with the post-ICA period (row 2), but I also break down the post-ICA period into four sub-periods:

1989-93 This was the initial low price period during which the market was obliged to absorb stocks previously held back in producing countries as the result of ICA quota restrictions on exports.

1994-98 1994 saw prices surge as the result of frosts in Brazil. Prices remained above normal levels through the following three years.

1999-2003 These were the Coffee Crisis years. Low prices resulted from the emergence of Vietnam as a major robusta exporter and from the substantial expansion of mechanized production in Brazil.

2004-05 These two years show recovery to normal prices in the context of a more general commodity price boom.

A number of features are apparent from Tables 3 and 4.

a) In all periods, and for almost all countries, the producers' value share was higher for arabicas than for robustas. It seems likely that this reflects the higher costs incurred by arabica farmers and hence does not imply that they obtained a superior return.

b) There is considerable variation across producers within each group. In arabicas, producers in Kenya and Tanzania have seen much greater share variability than have their counterparts in Latin America, particularly Brazil and Colombia. There is greater consistency in the pattern exhibited by the robusta producers. In common with the East

African Arabica producers, Uganda has experienced the greatest share variability, but Côte d'Ivoire, Indonesia and Vietnam have seen the greatest erosion of share.

c) Although it is true on average that most arabica and robusta producers have lost value share in the post-control period, this is not uniformly true. In particular, Brazilian robusta producers are seen as having experienced a small value share gain[9] and the loss of share in Uganda is very small.

d) Value shares did fall to very low levels for robusta producers over the Coffee Crisis years. There has subsequently been some recovery for a number of these producers, but the recovery has not been uniform.

Table 4
Value Shares for Robusta Coffee Producers, 1980-2005

	Brazil	Côte d'Ivoire	Indonesia	Uganda	Vietnam	Average
1980-88	14.4%	17.5%	19.2%	16.5%	43.6%	23.8%
1989-2005	14.7%	10.3%*	11.9%	15.1%**	13.6%	13.2%
1989-93	12.3%	12.5%	10.4%	8.1%	14.5%	11.6%
1994-98	21.8%	12.1%	19.5%	24.5%	19.1%	19.4%
1999-2003	10.5%	7.2%*	7.0%	12.2%**	8.6%	9.1%
2004-05**	13.2%	6.5%	8.7%	-	10.1%	12.1%

The table gives the producer price for coffee beans as a share of the U.S. retail price of coffee. All prices are measured in U.S. dollars. The final column gives a simple average of the five country shares. Years are calendar years. Source: ICO

* No figure is available for 2001 in Côte d'Ivoire.

** I have disregarded the figures reported by the ICO for Ugandan producer prices in 2003-05 as being implausibly high.

These diverse patterns underlines the argument advanced in section 4 that the accounting framework which underlies much GVC analysis over-simplifies the allocation of overall value. One should be cautious about drawing strong conclusions from changes in the value share of a single producer or even from an average. The most one can conclude simply from inspection of the information in Tables 2 and 3 is that there has been some general loss in producer value share in the post control period, that these value shares were indeed very low for robusta producers over the Coffee Crisis years, but that there has been a general but non-uniform recovery over the most recent years. This is illustrated in Figure 5 which shows the average value shares across the five Arabica and robusta producers considered in Tables 2 and 3 respectively.[10]

[9] The bulk of Brazilian robusta is consumed domestically so a value share relative to U.S. retail prices is not very interesting.

[10] The figures are simple averages.

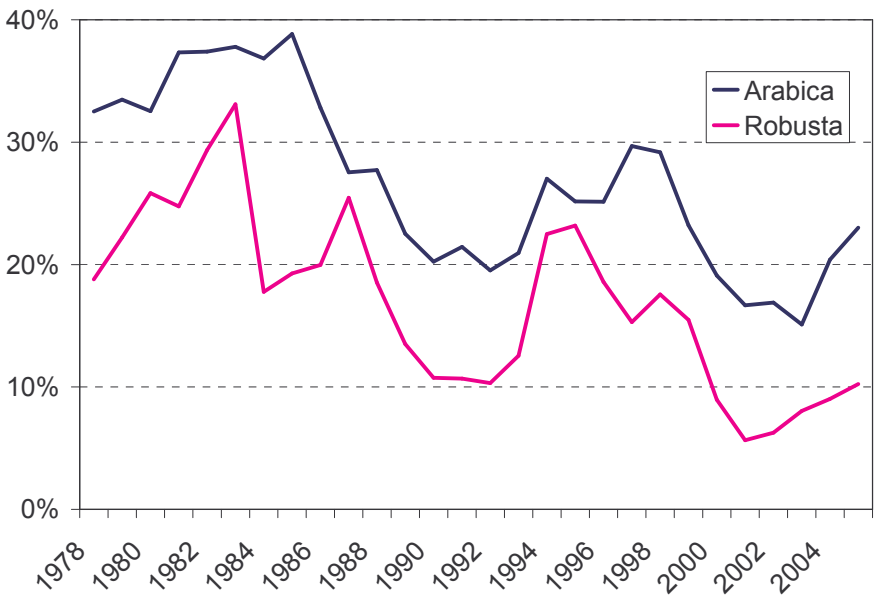

Figure 5: Average Arabica and Robusta Producer Value Shares, 1978-2005

The shares reported in Tables 3 and 4 and graphed in Figure 5 all compare the producer price received by the farmer with the U.S. retail price of coffee. Much of the coffee from central and south America is sold in the United States so that is a natural comparison. However, Kenyan coffee is primarily exported to northern Europe and Japan has become a major importer of Tanzanian coffee. Figure 6 charts the Kenyan producer share of retail prices in the United States, Germany and Japan. Through the nineteen eighties, Kenyan producers attained a consistently higher share of the US retail price than they did of the German price, but these shares have now converged and move closely together. By contrast, Japanese retail coffee prices are much higher and the producer share is therefore correspondingly lower. While it is possible that coffee processors have greater market power in Japan than in Europe or North America, but it is equally likely that these share differences reflect differences in the way coffee is retailed in Japan.

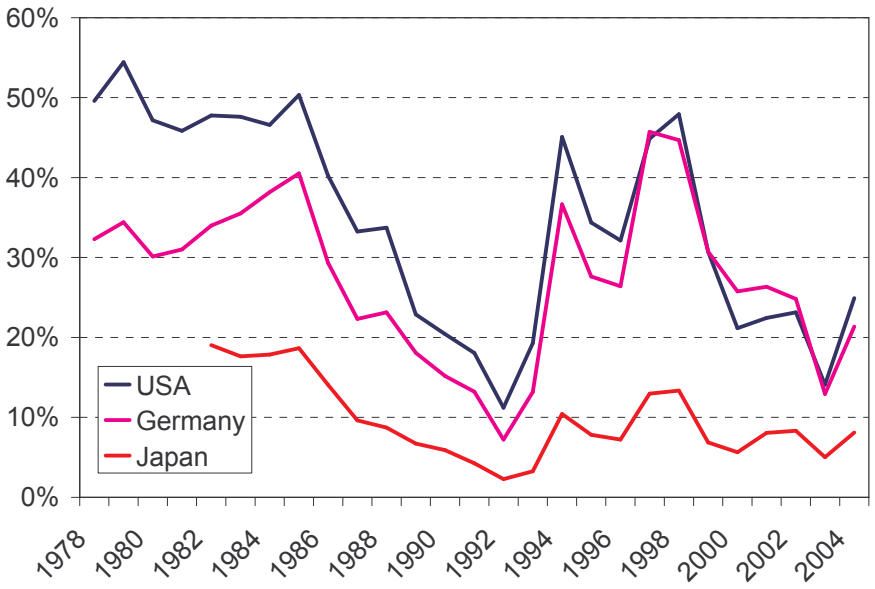

Figure 6: Producer Value Share, Kenya, 1978-2004

7. The Producers' Value Share in Cocoa

A clear albeit brief recent discussion of the cocoa and chocolate value chain may be found in Oxfam (2002a). According to that report, "farmers receive at best about 5% of the retail value of chocolate" (*ibid*, p.23). The report also remarks that retailers have considerable market power in chocolate and that they obtain high margins. The most thorough discussion is that reported by ICCO (1990).[11] This study is highly detailed but it relates exclusively to the United Kingdom and covers the period 1975-88. It is beyond the scope of this paper to update the detail of these results or to extend them to other consuming countries. However, in what follows, I rely heavily on the ICCO calculations.

It is more difficult to calculate the producers value share for cocoa than coffee because chocolate is a more heterogeneous product than roast or soluble coffee. In particular, and unlike roast coffee, chocolate incorporates other raw material inputs, notably milk and sugar. The cocoa content of a particular chocolate item therefore depends on the "recipe", and there is substantial variation in these recipes across chocolate product varieties and consuming countries. We may infer U.K. chocolate recipes over the period 1975-88 from the figures in ICCO (1990).[12] Average cocoa contents over this fourteen year period are charted in Figure 7. Cocoa content varies from 26½% in solid plain chocolate to just 2½% in chocolate liquors.

[11] Authored by Henri Jason.
[12] These figures relate to the chocolate sector and exclude confectionary which also uses some cocoa.

The weighted average across the nine product varieties is 11.3%. On average, cocoa accounted for 39.4% of the raw material input cost into chocolate products.

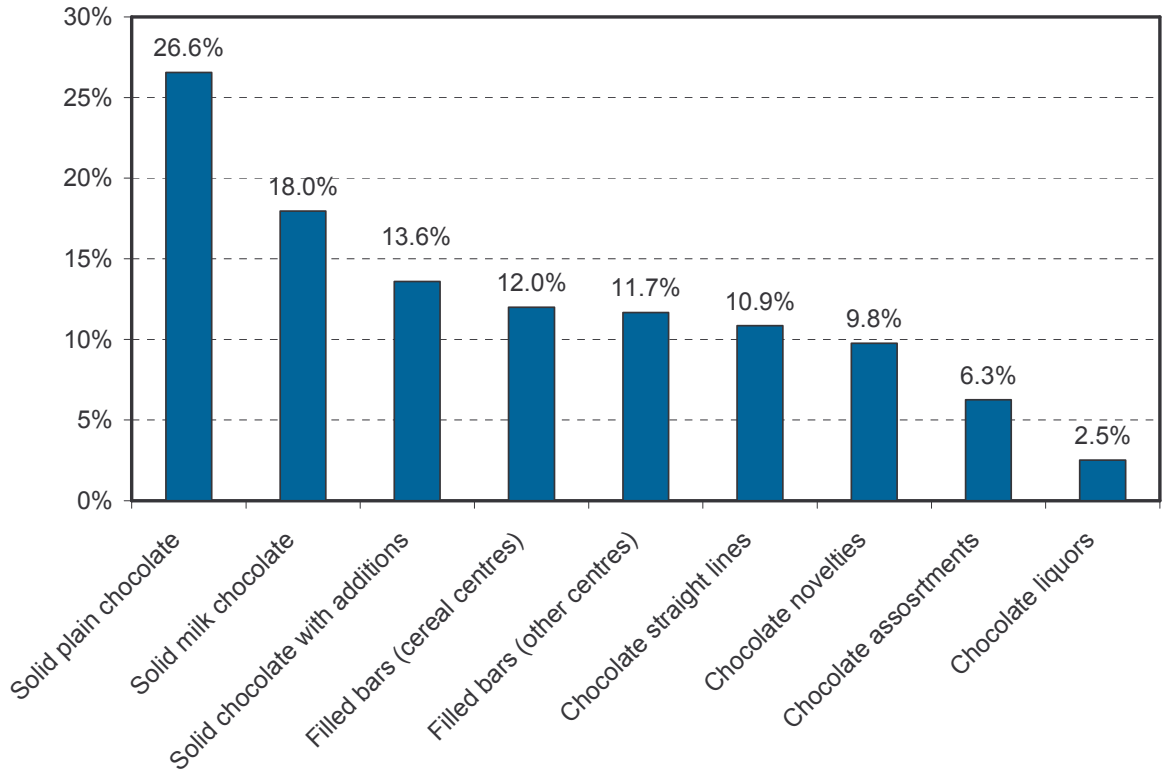

Figure 7: Cocoa Content of Different U.K. Chocolate Products, 1975-88

ICCO (1990) provides an estimate of the average retail price of chocolate products in the U.K. over the period 1975-84 based on detailed cost analyses of the nine product lines illustrated in Figure 7. I have updated these estimates to 2005 on a much more crude basis by using the "sweets and chocolates" component of the U.K. Retail Price Index.[13] The results of these calculations are shown in Figure 8 which charts the price of chocolate in the U.K. (£/lb) deflated by the U.K. producer price index, the ICCO Indicator Price converted into sterling and similarly deflated, and finally producer prices of cocoa in Côte d'Ivoire and Ghana on the same basis.[14] (The time pattern for other cocoa producers is similar). The figure shows the chocolate price rising from a 1984 low of £2.88/lb to a high in 2005 of £3.61/lb. Over the same period, cocoa producer prices have tended to fall in real terms from around 40p/lb in 1984 to around 20p/lb in 2005.

[13] Source: U.K. National Statistics StatBase. This series was no longer calculated after 2005. Note that the coverage of this index is broader than the chocolate index developed in ICCO (1990).

[14] I am grateful to the ICCO for access to their data on cocoa producer prices used in this figure and reported in Table 5. While it would be more natural to deflate the chocolate price by a consumer price index, this would be a less appropriate deflator for the producer prices.

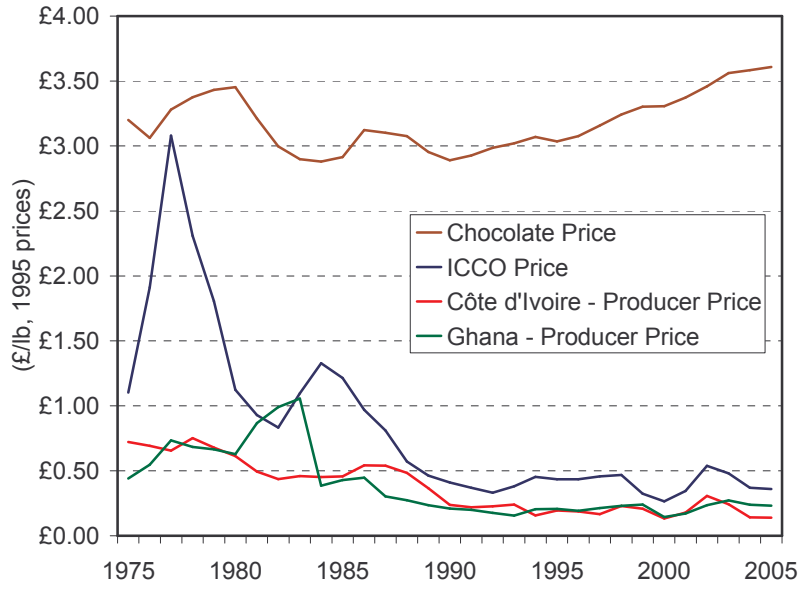

Figure 8: Real Price of Chocolate in the U.K., and Real Sterling Cocoa Prices

Table 5
Cocoa Producer Price as a Share of the U.K. Chocolate Price, 10 Year Averages

	1976-85	1986-95	1996-2005
Brazil	34.9%	11.9%	10.8%
Cameroon	17.5%	11.7%	7.1%
Côte d'Ivoire	17.9%	10.6%	5.7%
Dominican Republic	34.9%	9.9%	7.5%
Ecuador	34.7%	13.3%	9.1%
Ghana	22.3%	8.0%	6.4%
Indonesia	23.7%	11.2%	8.1%
Malaysia	28.9%	13.6%	10.3%
Nigeria	31.2%	18.8%	18.7%
Average	*27.3%*	*12.1%*	*9.3%*

Producer prices (source: ICCO) converted into Sterling at annual average £:$ exchange rate (source: IMF, International Financial Statistics) as a proportion of the UK chocolate price (£/ton) – see text for source and explanation.
Cameroon: no producer price for 2004-05.
Dominican Republic: no producer price for 2003 and 2005.
Ecuador: no producer price for 1976-77.
Indonesia: no producer price for 2003-05.
Malaysia: no producer price for 1976-80.

Table 5 gives 10 year averages of the ratio of sterling cocoa producer prices for eight major cocoa producers to the U.K. chocolate price over the period 1976-2005. The table confirms the visual impression of Figure 8 – a sharp drop in the share of cocoa producers in the

chocolate price over the 1976-85 decade, followed by a much more modest fall from 1986-95 to 1996-2005. Lacking similar retail price data for other consuming countries over a comparable period, it is not possible to be absolutely confident that the trend illustrated in Figure 8 and Table 5 is general, but calculations for the United States (not reported here) from 1985 tell a similar story.

8. Econometric Framework

Sections 6 and 7 demonstrated a common negative tendency in the shares of coffee and cocoa farmers in retail coffee and chocolate prices over the past three decades. Arabica farmers have seen their value shares decline from around 35% in the late nineteen seventies to around 20% in the current decade while the decline for robusta farmers has been from around 25% to around 10% over the same period. On the basis of more limited data, the share of cocoa farmers in the chocolate price has declined from around 30% to 10% over the same period. The decline is fairly uniform across the different cocoa producers but there is greater variety in the coffee experience with some producers experiencing only a modest share decline.

The commonality in the decline in producer shares across the coffee and cocoa sectors indicates that a common explanation is required. This suggests that the explanation should probably be sought in the coffee and chocolate consuming countries rather that in the producing countries. To proceed in this direction, we follow the analysis developed in section 3 in considering producer shares of retail prices as having two components – the producer share of the terminal market price and the share of the terminal market price in retail prices.

Equation (3) expressed the producers' share ω in the retail price as the ratio of the producers' share σ in the terminal market price and the ratio of the retail price to the terminal market price: $\omega = \frac{\pi / f}{p / f}$. This decomposition separates the forces at work in the retail market from those that determine the producer share of the world price. This separation will be valid if market forces act through terminal market price and are transmitted from these prices both upward to retail prices and downward to producer prices. What is ruled out is any direct link between producer prices and retail prices, as, for example, might exist if vertically integrated

processing companies set retail prices directly on the basis of the prices they pay farmers and not on the terminal market value of these purchases, which measures their opportunity cost.

If this decomposition is not to be misleading, it is important that the numerator and dominator of the ratio $\omega = \frac{\pi / f}{p / f}$ be in some sense independent. Statistical independence is too strong a condition, and in fact the terms are highly correlated. A weaker requirement, which is nevertheless sufficient for our purposes, is that the two terms are causally independent in the sense that neither Granger-causes the other. Absence of Granger-causality allows us to discuss the evolution of the two ratios independently, as we shall in sections 9 (the producer share of the terminal market price) and 10 (terminal market prices as a ratio of retail prices).

Table 6
Granger Causality Tests

	Arabica Coffee	**Robusta Coffee**	**Cocoa**
$\frac{\pi}{f} \rightarrow \frac{p}{f}$	26.82 [0.0%]	0.273 [76.3%]	0.757 [48.0%]
$\frac{p}{f} \rightarrow \frac{\pi}{f}$	3.812 [3.7%]	2.086 [14.7%]	2.308 [12.1%]

Fob prices (*f*): arabica - ICO Other Milds; robusta – ICO Robusta Index; cocoa – ICCO Index.
Tail probabilities in parentheses.
A tail probability of less than 5% is required to reject at the 95% level.
Coffee: 1978-2005. Tests are $F_{2,23}$
Cocoa: 1977-2005. Tests are $F_{2,24}$

We need to reduce the dimensionality of the data to carry out these tests. I therefore construct average producer prices for each of arabica coffee, robusta coffee and cocoa and an average retail price for all processed coffee.[15] Table 6 reports the resulting set of six Granger-

[15] Arabica weights: Brazil 56.7%, Colombia 29.6%, Guatemala 8.3%, Kenya 3.6%, Tanzania 1.8%. Robusta weights: Brazil 0.2%, Côte d'Ivoire 25.2%, Indonesia 39.7%, Uganda 15.5%, Vietnam 19.4%. Cocoa: Brazil 19.2%, Cameroon 6.8%, Côte d'Ivoire 32.7%, Ecuador 4.9%, Ghana 16.0%, Indonesia 4.4%, Malaysia 6.6%, Nigeria 9.4%. Weights are based on production shares over 1096-2005. I assume that Brazil and Tanzania 90% arabica and 10% robusta and that Uganda is 90% robusta and 10% arabica. The retail coffee price index is a simple average of the retail prices discussed in section 6. The retail chocolate price is the U.K. chocolate price – see section 7.

causality tests based on a VAR[16] of lag length 2. There is no evidence of any Granger-causal link in either direction for robusta coffee or cocoa, but there is strong evidence a link from arabica producer prices to the ICO Other Milds Index and weaker evidence for the reverse link. I conjecture that these dependencies arise out of the dominant position of Brazil in the arabica market.

These test outcomes suggest that there should be no problem in analyzing the producer and retail markets for robusta coffee and for cocoa separately, but caution that results may not be valid for arabica coffee where there may be a direct dependence of retail prices on producer prices.

9. Producer Shares in Terminal Market Prices

We first consider the denominator of the ratio of equation (3) and in particular the relationship between the ten coffee producer prices distinguished in section 6 and the relevant fob prices (i.e. either the ICO Other Milds Index or the ICO Robustas Index). Here, we need to consider the wedge between the two prices. These wedges will reflect a variety of factors:

- transport and other costs in getting the coffee to port and selling to an exporter (*c* in section 5),
- taxation,
- any quality premium or discount relative to the fob price.

Market liberalization has exerted downward pressure on the first of these components – see Akiyama *et al*. (2001) for coffee and Varangis and Schreiber (2001) for cocoa. At the same time, the governments of many coffee exporting countries have reduced export taxation in response to low producer prices. However, some governments, which remain heavily dependent on commodity export taxation, have been unable to proceed in this direction. Quality differentials tend to be fairly consistent over time for cocoa and robustas but vary considerably for arabicas depending on the relative availability of different types of beans – see Gilbert and Tollens (2003) on West African cocoa differentials.

[16] Vector AutoRegression. The VAR regresses each ratio on two lags of itself and the other ratio. The Granger non-causality test is the standard Wald test for the exclusion of the latter two lagged variables. See Stock and Watson (2003, p.449) for a discussion of Granger causality tests.

For these reasons, it seems unlikely that there will be much consistency across countries in the behaviour of producer shares of the fob price. Figure 9 shows average producer share of the ICO Other Milds index for the five arabica producers over the most recent five year period (2001-05) by comparison with the five years 1986-90 at the end of the ICO control period and the five years 1976-80 which covered the coffee boom. Figure 10 shows the comparable share of the ICO Robustas index for the five robusta producers.

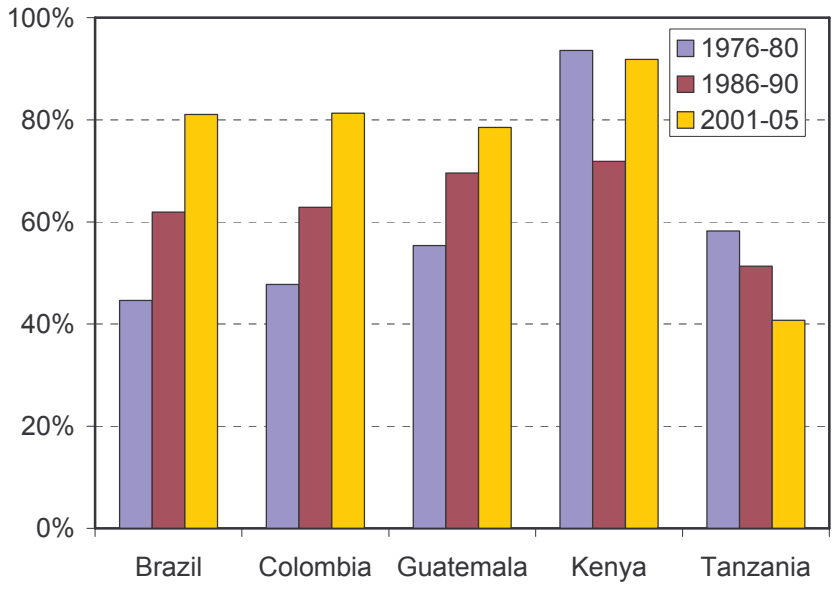

Figure 9: Arabica Producer Prices as a Share of the ICO Other Milds Index

There is considerable variation in both the levels of these ratios and the change over the 25 year period considered.

- The three Latin American coffee producers exhibit a steady increase in producer share.
- Tanzanian farmers obtain the lowest share of the fob arabica price. Furthermore, this share has tended to decrease over time while arabica producers in other countries have seen increased shares.
- There is no general tendency evident in the producer share for robusta farmers. Brazilian and Ugandan robusta producers have benefited from a high and rising share, while farmers in Côte d'Ivoire and Vietnam have witnessed a decline in their shares of the world price, albeit from a high level in the case of Vietnam.

Overall, however, it is clear that there has been no general downward tendency for the producer's share of terminal market prices. Rather, market liberalization, reduced taxation and quality improvements have tended to generate high producer shares. The evidence is

insufficient to allow us to conclude that there has been no increase in monopsony or oligopsony power over the pat decades, but any such effects must have been sufficiently small to be offset by these other factors.

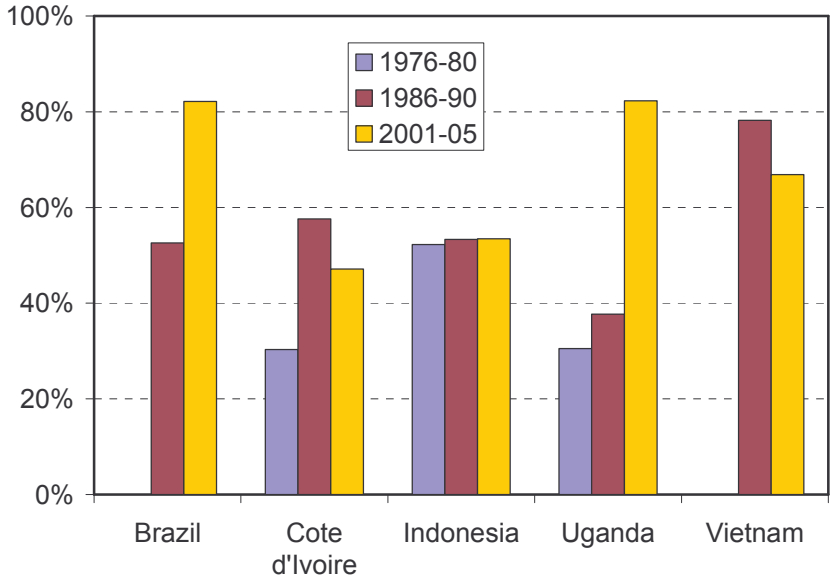

Figure 10: Robusta Producer Prices as a Share of the ICO Robustas Index[17]

Figure 11 reports the same calculations for cocoa producers. The general tendency was for producer shares to rise over the nineteen eighties, from an average of 55% in 1976-80 to 69% in 1986-90. There was little overall change over the more recent decade with increased shares in Brazil, Ghana, Indonesia and Malaysia offset by falls elsewhere.

Notable in Figure 11 is the convergence of producer shares in the West African countries with those elsewhere in the world. West Africa is responsible for approximately 70% of world cocoa production. Côte d'Ivoire is the largest producer with 40% of world production followed by Ghana at 20%. Cameroon and Nigeria are also significant producers. Historically, West African cocoa was marketed through monopoly-monopsony market boards (Ghana and Nigeria) or sold through caisses de stabilisation (Cameroon and Côte d'Ivoire). These arrangements were absent in other cocoa exporting countries, of which the most important is Indonesia, responsible for approximately 10% of world production. The West African marketing systems have been comprehensively liberalized starting with the 1986 abolition of agricultural marketing boards in Nigeria.[18] As a consequence, the region

[17] Brazil 1987-90, Uganda 2001-02 and Vietnam 1988-90.
[18] The cocoa liberalization experience is discussed in Gilbert (1997), Varangis and Schreiber (2001) and Gilbert and Varangis (2004).

operates under broadly the same structure as the remainder of the sector, although a slimmed-down marketing board continues to function in Ghana.

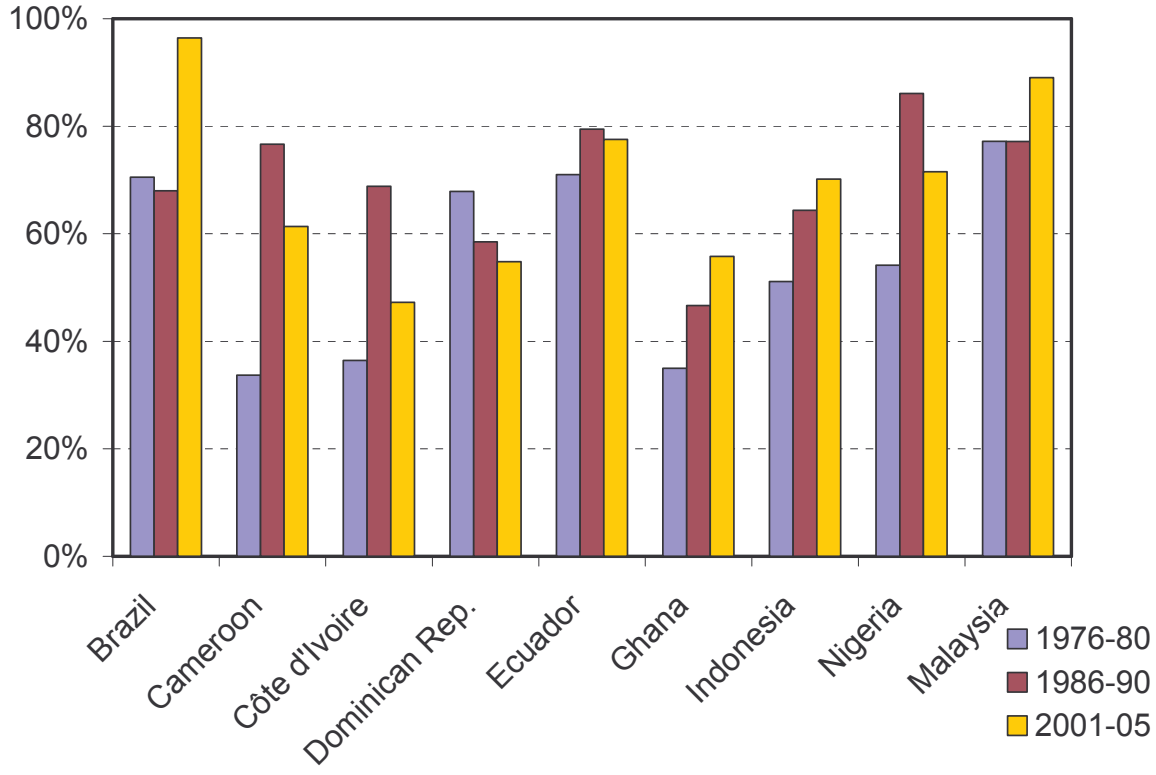

Figure 11: Cocoa Producer Prices as a Share of the U.K. Chocolate Price [19]

As in the case of coffee, there has been no tendency for the producer's share of terminal market prices to fall. Indeed, on the limited evidence available cocoa producer shares have rose consistently across almost all producing countries over the nineteen eighties, in part because of market liberalization. We can draw two conclusions:

- The decline in the producer share of retail coffee and chocolate prices, documented in sections 6 and 7, must therefore be despite and not because of lower producer shares in terminal market prices. Explanation for the declining share of retail prices must be sought in the retail market.
- By itself, the evidence marshalled in this sub-section is insufficient to demonstrate that roasters have not exercised monopsony or oligopsony power, but it does show that any increase in monopsony power, which would have reduced producer shares of terminal market prices, has been offset by other factors.

[19] Source: as Table 5. Certain averages are curtailed over a reduced number of observations – see Table 5 for details.

10. The Margin of Retail Over Terminal Market Prices

In analyzing the margin of retail prices over terminal market prices, I revert to the model set out in section 5. First consider retain coffee prices. The retail coffee price in each consuming country is modelled in terms of the terminal market prices for arabica and robust coffee and, as a measure of processing and distribution costs, the wage rate in the country in question. Unfortunately, information on advertising costs and country-specific measures of market concentration are lacking.

I adopt the simplest possible specification:

$$\ln p_{it} = \alpha_i + \beta_i \left[\delta_i \ln f_t^a + (1-\delta_i) \ln f_t^r \right] + (1-\beta_i) \ln w_{it} + \gamma_i trend_t + u_{it} \qquad (6)$$

where p_{it} is the year t retail price of coffee in country i, converted into U.S. dollars, w_{it} is the year t wage rate or average earnings index for country i, converted into U.S. dollars,[20] f_t^a and f_t^r are respectively the ICO indices of arabica ("Other Milds") and robusta prices for year t, $trend_t$ is a time trend incrementing at one per year and u_{it} is an error term. The equation expresses retail coffee prices in each country as a (geometric) weighted average of the world prices of arabica and robusta beans and the local wage rate. The coefficient β_i $(0 \le \beta_i \le 1)$ measures the share of coffee in total production costs in country i while δ_i $(0 \le \delta_i \le 1)$ measures the share of arabica in country i's total coffee costs.[21] Finally, the coefficient γ_i measures the annual rate at which the retail margin in country i is either increasing or decreasing. Increased monopoly or oligopoly power on the part of the roasters will imply a positive value for γ_i while productivity advances in retailing and distribution will yield a negative value.

[20] Source: IMF, *International Financial Statistics*.

[21] It is preferable to use the ICO Other Milds and Robusta prices rather than the ICO Indicator Price because this allows separation of the arabica and robusta weights. The Indicator Price averages these two prices with the ICO price indices for Brazilian naturals and Colombian milds. While the Other Milds and Robusta prices derive from terminal market prices, the Brazilian naturals and Colombian milds derive from trade quotations which may be less representative of world conditions.

The first eight rows of Table 7 report the coefficient estimates.[22] The estimated share of coffee in total retail coffee costs is around 45% in much of continental Europe but only around 30% in Germany, the U.K. and the U.S.A. These coefficients are fairly precisely determined, except in the case of Italy where the fit is poor. Arabica predominates over robusta with the arabica share around 70%. The estimates, which are only imprecisely determined, are lower for Germany and the U.K., and higher for France, Italy and the U.S.A. The estimated time trends are uniformly negative, although these coefficients are small and statistically insignificant for the U.K. and the U.S.A. The Netherlands is close to being the representative coffee-consuming country with all coefficients except γ corresponding to the sample median.

Overall, the estimates give little support to the view that increased monopoly power has pushed up retail coffee prices. Instead, retail margins appear to have fallen over time, particularly in France and Germany, suggesting productivity advances have outweighed any tendency towards increased monopoly power.

The estimates in Table 7 imply that, in the base year of 2000, coffee itself accounted for only around 40% of the retail price of coffee, the remaining costs being associated with processing and distribution.[23] These costs have tended to rise over time even in real terms with the result that real retail coffee prices have only fallen modestly despite steep the fall in fob coffee prices. The result is that processors' gross margins, which include consuming country costs, have risen, while the producers' share of the retail price has fallen.

[22] Estimation is by Nonlinear Least Squares (NLS). It is possible to reparameterize the equation in such a way as to allow estimation by Ordinary Least Squares. The advantage of direct NLS estimation is that the standard errors and equation statistics relate directly to the equation as formulated in (6). The estimates of δ for France and Italy are constrained at unity. The sample is 1976-2005 except for the U.K. and U.S.A. where the fit was poor over the observations for 1976-1984 which were omitted from the sample. The U.K. equation also includes a dummy variable for 1993-94 which may account for an exchange rate-related effect. The equation residuals exhibit some serial correlation which may have the effect that the reported standard errors being too low. In section 8, I noted that, in the case of arabica coffee, it is not necessarily possible to analyze the producer and retail markets separately – see Table 6. I suggested specifically that retail coffee prices might depend on arabica producer prices directly and not via the ICO Other Milds price. The final column of Table 7 reports Lagrange Multiplier t tests for omission of the average producer price variable discussed in section 8. The null hypothesis of no misspecification is rejected for Italy and the U.S.A. with a marginal failure to reject for France. The results for the four remaining countries appear secure.

[23] Coffee prices were low in 2000. Use of a different year as base would give a higher coffee share.

Table 7 Retail Coffee and Chocolate Price Equations					
	Coffee Weight β	**Arabica Share δ**	**Trend (p.a.) γ**	**R^2**	**Specification *t***
France	45.9% (9.7%)	100% (restricted)	- 3.2% (0.9%)	86.4%	2.03 [5.3%]
Germany	30.5% (8.4%)	57.8% (58.7%)	- 2.9% (0.9%)	85.5%	0.88 [38.8%]
Italy	46.0% (11.6%)	100% (restricted)	- 0.6% (1.2%)	53.3%	3.73 [0.1%]
Netherlands	38.1% (7.2%)	71.6% (40.2%)	- 0.3% (0.6%)	79.8%	0.59 [56.3%]
Sweden	46.2% (6.7%)	69.4% (32.7%)	- 1.8% (0.7%)	80.9%	0.73 [47.1%]
U.K.	27.2% (3.3%)	45.9% (30.3%)	- 0.3% (0.3%)	75.0%	1.37 [11.2%]
U.S.A.	34.2% (5.6%)	96.7% (34.7%)	- 0.5% (0.5%)	73.7%	2.46 [2.5%]
Average **Median**	38.3% 38.1%	77.3% 71.6%	-1.4% -0.6%	76.4% 79.8%	
	Cocoa Weight β	**Exponent λ**	**Trend (p.a.) γ**	**R^2**	
U.K. Chocolate	23.1% (2.0%)	- 3.6% (0.8%)	- 0.5% (0.2%)	87.2%	0.17 [86.7%]

Coffee: equation (6). Cocoa: equation (7). Estimation by Nonlinear Least Squares, standard errors in "()" parentheses. Sample: 1976-2005 except U.K. coffee and U.S.A. (1985-2005).
The final column reports the Lagrange Multiplier omitted variable test, distributed as a Student t, for omission of the average producer price variables discussed in section 8. The tail probability in "[]" parentheses must be less than 5% for rejection of the null of no misspecification at the 95% level.
Equations also include an intercept. The U.K. coffee equation includes a dummy variable which takes the value unity in 1993 and 1994.

This is illustrated in Figure 12 which shows the deflated retail coffee price averaged across the seven countries we have analyzed, the real wage averaged across the same seven countries and the deflated ICO Indicator Price. (All indices are set to 100 in 2000). The figure also shows a price index formed by averaging the ICO Indicator Price and the real wage index. This tracks the average retail coffee price remarkably well.[24]

[24] $r^2 = 0.63$. Note that this is not the outcome of any statistical fitting exercise.

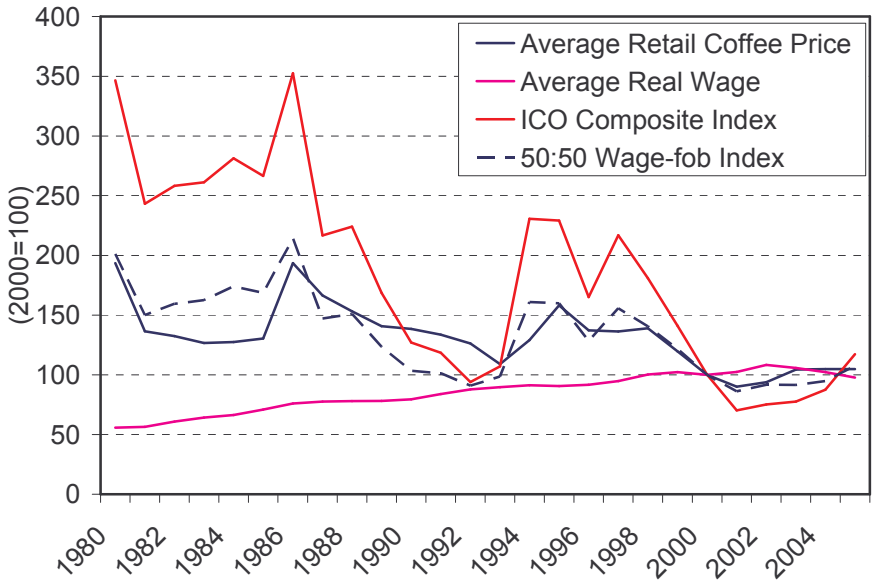

Figure 12: Average Consuming Country Retail Coffee Prices and Wages

The results from estimating a similar relationship to equation (6) for the U.K. chocolate price are less clear-cut. As discussed in sections, cocoa is only one of the ingredients used in the manufacture of chocolate. Milk and sugar are also important, and may contribute more to overall chocolate costs. Despite this, no clear statistical relationship between U.K. chocolate prices and the prices of milk and sugar is evident. I therefore elected to relate the chocolate price simply to the cocoa price and the U.K. wages index. However, to obtain a reasonable fit, it was necessary to modify the equation in two further respects:

- The terminal market cocoa price enters with a one year lag reflecting the practice in some major U.K. chocolate firms of hedging their cocoa purchase a year ahead.[25]
- There is clear evidence that the weight of the cocoa price in determining chocolate prices has declined over time. We modify equation (6) to reflect this.

The modified equation thus becomes

$$\ln p_t = \alpha + \beta e^{\lambda . trend_t} \ln f_t + \left(1 - \beta e^{\lambda . trend_t}\right) \ln w_t + \gamma . trend_t + u_t \qquad (7)$$

Estimated coefficients are given in the final row of Table 7. Cocoa is seen as accounting for only 23% of chocolate costs at the start of the sample (1976), but this weight is seen as declining at 3½% per annum with the result that the estimated weight of cocoa in overall

[25] We use the ICCO Indicator price. Ideally, we should use the lagged one year futures price in place of the lagged ICCO index, but the two will be highly correlated. The equation also includes a dummy variable for 1978, the year following the 1977 high cocoa prices when futures were below spot prices.

U.K. chocolate prices is now only 7%. Equation fit is comparable to that for the coffee equations.

Cocoa is seen as accounting for only a small and declining proportion of retail chocolate prices. The largest component of chocolate production costs are incurred in the consuming countries themselves and appear to be related to labour costs. The decline in terminal market cocoa prices is therefore only reflected to a limited extent in retail chocolate prices. In the U.K., the continued growth in real wages (measured relative to the PPI) have resulted in stability of the real chocolate price despite lower cocoa prices. The consequence is a rise in the margin of chocolate prices over terminal market prices and a decline in the producer share of the chocolate price even though producers have obtained an enhanced share of cocoa terminal market prices.

11. Conclusions

Because value chain analysis is only a framework for analysis, it does not, by itself, have substantive implications. The issue is whether it is useful, not whether it is correct. Gereffi *et al.* (1994) assert that GVC analysis "… allows us to pose questions about contemporary development issues that are not easily handled by previous paradigms …" (*ibid*, p.2). The value chain is seen as a geographically distributed network and the GVC "approach explains the distribution of wealth within a chain as an outcome of the relative intensity of competition within different modes" (ibid, p.4). I have argued that if GVC analysis is to be employed for this purpose, it must be augmented by the standard tools of industrial organization which are routinely used in the analysis of competition.

Proponents of GVC analysis tend to imply that their approach substitutes conventional microeconomic models. This cannot be the case since GVC analysis does not have substantive content. Instead, GVC analysis can complement conventional tools by providing a potentially richer context in which these tools can be employed.

Applications in the primary commodity industries have tended to use value chain analysis to suggest that processors have exerted monopoly-monopsony power with the result that producers' shares of the retail price have been squeezed. This impression is given credence by the high levels of processor concentration in some of these industries. The analysis of the coffee and cocoa industries in this paper has failed to provide any evidence supportive of this

view. Rather, the decline in producer value shares is seen to reflect an evolution of the cost structures in the processing industries. The conjunction of lower raw material (coffee and cocoa bean) prices with a continuing rise in the real labour and other costs incurred in the consuming countries has resulted in real retail prices declining only modestly (coffee) or remaining broadly stable (chocolate). Despite the high levels of concentration in both cocoa conversion and coffee roasting, there is no evidence that this shift in cost structures has anything to do with relative intensities of competition. This is a conclusion which is absolutely compatible with the GVC framework – a question has been posed any answered negatively – but it does contradict the expectations of the GVC proponents.

The explanation for the decline in the producer share of the retail coffee price is simpler – only around one half of the cost of roast coffee is attributable to the coffee beans themselves. The other half is the result of processing, transportation and marketing costs incurred in the consuming countries and these costs have tended to increase or remain broadly constant. The fall in the world price of coffee had no effect on these consumer country costs. Retail coffee prices reflect all production costs, not just those incurred in producing countries.

Cocoa accounts for an even smaller proportion of retail chocolate prices since chocolate products incorporate other raw materials. Evidence for the U.K. suggests a cocoa value share which has declined from around one quarter to less than 10% over the past three decades. The effect of declining cocoa prices have been offset by real increases in some of these other costs keeping real chocolate prices broadly stable. Even though many cocoa farmers have benefited from an increased share of fob prices, the decline in cocoa costs as a proportion of retail chocolate prices has implied a decline in the producer share of retail chocolate prices.

Some commentators suggest that market liberalization in the cocoa and coffee producing countries, often seen as imposed and/or poorly executed, has contributed to the decline in producer shares of retail prices. This is not the case. The general tendency has been for producers to obtain an increased share of the fob price has offset the tendency for fob prices to decline as a proportion of retail prices. Absent market liberalization, producers (particularly West African cocoa producers) would have seen an even larger decline in their share of retail prices.

Do declining value shares matter? Farmers are interested in prices, not value shares. If producer prices had risen in real terms, it would be irrelevant to them if retail prices had risen faster. The coincidence of falling real producer prices and stable or near stable product prices generates an impression of inequity even if, as is broadly the case in the coffee and cocoa industries, changes in the producer share of fob and the retail margin over fob are independent.

The likely long term course of cocoa and coffee prices depends on labour market conditions and productivity in the producing countries. Sadly, many of the countries in which tropical commodities are produced have seen only slow growth over recent decades with the result that few alternative occupations are available to farmers. If these countries can generate more rapid development in the future, it will be necessary either to offer higher producer prices or for farmers to increase productivity levels. Farmers will benefit either by earning more for the same levels of production or by producing more for the same price. In that circumstance, it will be irrelevant to them whether retail coffee and chocolate prices have risen by more or by less than their earnings.

Appendix: A Value Chain Model

This section sets out the model used in section 5 of the paper. Consider the market for a homogenous final product, price p, produced from a homogeneous raw material input price π. Aggregate demand Q for the final product is

$$Q = \alpha - \beta p \tag{A1}$$

Assuming 100 per cent conversion ratio, aggregate supply of the raw material is

$$Q = \gamma + \varphi\pi \tag{A2}$$

I assume uniform processing costs of c to the fob price and k from the fob price to the price of the processed good. Under competition, the price p^c of the final product is

$$p^c = \frac{\alpha - \gamma}{\beta + \varphi} + \frac{\varphi}{\beta + \varphi}(c + k) \tag{A3}$$

Similarly, the commodity price π^c under competition is

$$\pi^c = \frac{\alpha - \gamma}{\beta + \varphi} - \frac{\beta}{\beta + \varphi}(c + k) \tag{A4}$$

Aggregate output is

$$Q^c = \frac{\alpha\varphi + \beta\gamma - \beta\varphi(c + k)}{\beta + \varphi} \tag{A5}$$

The producers' value share ω^c of the final price π of the processed good is

$$\omega^c = \frac{\alpha - \gamma - \beta(c + k)}{\alpha - \gamma + \varphi(c + k)} \tag{A6}$$

The fob price f is given by

$$f^c = \pi^c + c = \frac{\alpha - \gamma + \varphi c - \beta k}{\beta + \varphi} \tag{A7}$$

and hence the producer's share σ of the fob price is

$$\sigma^c = \frac{\alpha - \gamma - \beta(c + k)}{\alpha - \gamma + \varphi c - \beta k} \tag{A8}$$

Similarly, the gross producer margin μ over the fob price is

$$\mu^c = \frac{p^c - f^c}{f^c} = \frac{k}{f^c} = \frac{(\beta + \varphi)k}{\alpha - \gamma + \varphi c - \beta k} \tag{A9}$$

Turning to the case on monopsony-monopoly, I suppose n identical incumbent firms, where n is a small fixed number. Entry is prohibitively expensive. Consider the profit Π_1 of firm 1 which chooses output level q_1:

$$\Pi_1 = (p - \pi - c - k) q_1 = \left(\frac{\alpha - Q}{\beta} - \frac{Q - \gamma}{\varphi} - (c + k) \right) q_1$$

Write $Q = q_1 + \sum_{j=2}^{n} Q_j = q_1 + Q_{-1}$. Then

$$\Pi_1 = \left[\left(\frac{\alpha}{\beta} + \frac{\gamma}{\varphi} - (c + k) \right) - \left(\frac{1}{\beta} + \frac{1}{\varphi} \right) (q_1 + Q_{-1}) \right] q_1$$

If the firms engage in Cournot competition, the first order condition for profit maximization gives

$$q_1 = \frac{\frac{\alpha}{\beta} + \frac{\gamma}{\varphi} - (c + k)}{2\left(\frac{1}{\beta} + \frac{1}{\varphi} \right)} - \frac{1}{2} Q_{-1} \tag{A10}$$

Since the firms are identical, the equilibrium must be symmetric with $Q_{-1} = (n - 1) q_1$. Hence

$$q_1 = \frac{\frac{\alpha}{\beta} + \frac{\gamma}{\varphi} - (c + k)}{(n + 1)\left(\frac{1}{\beta} + \frac{1}{\varphi} \right)}$$

and

$$Q^m = \frac{\lambda \left[\alpha\varphi + \beta\gamma - \beta\varphi (c + k) \right]}{\beta + \varphi} = \lambda Q^c \tag{A11}$$

where $\lambda = \frac{n}{n + 1}$. The price of the final product is

$$p^m = \frac{\alpha - Q^m}{\beta} = \frac{\alpha(\beta + \varphi) - \lambda \left[\alpha\varphi + \beta\gamma - \beta\varphi (c + k) \right]}{\beta(\beta + \varphi)} \tag{A12}$$

while the raw material price is

$$\pi^m = \frac{Q^m - \gamma}{\varphi} = \frac{\lambda \left[\alpha\varphi + \beta\gamma - \beta\varphi (c + k) \right] - \gamma(\beta + \varphi)}{\varphi(\beta + \varphi)}. \tag{A13}$$

The ratio of the raw material price π^m given by equation (A13) to the product price p^m given by equation (A12) corresponds to identity (1) and yields the producer share ω^m of total value. One obtains

$$\omega^m = \frac{\pi^m}{p^m} = \frac{(\lambda\alpha - \gamma) - (1-\lambda)\dfrac{\beta\gamma}{\varphi} - \lambda\beta(c+k)}{(\alpha - \lambda\gamma) + (1-\lambda)\dfrac{\alpha\varphi}{\beta} + \lambda\varphi(c+k)} \tag{A14}$$

The fob price *f* may be derived in the same way as in the competitive case:

$$f^c = \pi^c + c = \frac{\lambda[\alpha\varphi + \beta\gamma - \beta\varphi k] + \varphi[\varphi + (1-\lambda)\beta]c - \gamma(\beta+\varphi)}{\varphi(\beta+\varphi)} \tag{A15}$$

The producer's share σ of the fob price *f* follows as

$$\sigma^m = \frac{\lambda[\alpha\varphi + \beta\gamma - \beta\varphi(c+k)] - \gamma(\beta+\varphi)}{\lambda[\alpha\varphi + \beta\gamma - \beta\varphi k] + \varphi[\varphi + (1-\lambda)\beta]c - \gamma(\beta+\varphi)} \tag{A16}$$

while the monopolistic margin is given by

$$1 + \mu^m = \frac{\alpha(\beta+\varphi) - \lambda[\alpha\varphi + \beta\gamma - \beta\varphi(c+k)]}{\lambda\beta[\alpha\varphi + \beta\gamma - \beta\varphi k] + [\varphi + (1-\lambda)\beta]c - \gamma\beta(\beta+\varphi)} \tag{A17}$$

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