The Processing of Primary Commodities: Effects of Developed-Country Tariff Escalation and Developing-Country Export Taxes

Author(s): Stephen S. Golub and J. M. Finger

Source: *Journal of Political Economy*, Vol. 87, No. 3 (Jun., 1979), pp. 559-577
Published by: The University of Chicago Press
Stable URL: http://www.jstor.org/stable/1832023
Accessed: 10-03-2018 21:08 UTC

The Processing of Primary Commodities: Effects of Developed-Country Tariff Escalation and Developing-Country Export Taxes

Stephen S. Golub
Federal Reserve System

J. M. Finger
U.S. Department of the Treasury

Both DC (developed country) tariffs and LDC (developing country) export taxes are "escalated" to protect local processors of primary commodities. The paper develops an analytical model of north-south commodity trade which is used to estimate the effects of reciprocal elimination of these trade barriers for eight commodities. It is estimated that processing would increase by 9 percent in the LDCs and decline by less than 1 percent in the DCs. The LDC export revenue for the eight-commodity sample would increase by 11 percent, or just over $1 billion (based on 1973 trade flows), which is considerably more than the estimated effect of the Generalized System of Preferences.

I. Issue

It is often noted that developed countries (DCs) tend to have lower import duties on commodities which enter in raw form than on the processed products. This "tariff escalation" provides high rates of effective protection for the developed countries' processing sector, and hence inhibits the expansion of such activities in the developing countries (LDCs) (Balassa 1968; Yeats 1974, 1976). Reduction of

The authors would like to thank Lee F. Kolman and Raymond E. Oliver, Jr., for their valuable and efficient assistance. The order of the authors' names was determined by flipping a coin. The paper was completed while both authors were affiliated with the Treasury Department.

[*Journal of Political Economy*, 1979, vol. 87, no. 3]

TABLE 1

AVERAGE LDC EXPORT TAXES AND DC TARIFFS

	LDC Export Tax	DC Tariffs
Copra	6.0	.0
Coconut oil	4.0	10.1
Natural rubber	6.3	.0
Rubber articles	.0	7.6
Cocoa beans	26.5	3.2
Cocoa butter and powder	5.6	10.2
Raw cotton	11.9	.7
Cotton yarn and fabric	.0	9.9
Raw wool	11.8	1.3
Wool yarn and fabric	.0	11.4
Hides and skins	23.4	.0
Leather	13.3	6.9
Logs	11.3	.0
Sawn logs	4.0	1.1
Coffee beans	30.0	3.3
Soluble coffee	6.0	8.9

SOURCES.—The average tariffs were in all but one case (coffee) calculated from Yeats's 1976 tabulation. For coffee, the tariffs were obtained from tariff tables for the EEC, United States, and Japan. The export-tax information was obtained from a U.S. government interagency report on export restrictions (U.S. Government 1976). Export taxes and tariffs were averaged across countries using weights based on 1973 trade flows.

these tariffs on processed goods is often proposed as a way to improve the economic lot of the LDCs, but little has been done to implement such proposals. When industrial country policymakers have to choose between expanding processing in LDCs and not reducing it in their own countries, they usually side with their own processors.

Less often noted is the extensive use of export taxes by developing countries for the same purpose. The first column of table 1 shows that LDC export taxes are higher if products are exported in the primary rather than the processed form and hence tend to protect the processing activity in the country which produces the primary product.

Thus export-tax and import-tariff escalation tend to offset one another as far as the division of the processing pie is concerned. But both cause the price of the processed good to increase in the importing country, which reduces the size of that pie. It should then be possible to simultaneously reduce LDC export taxes on primary goods and DC import tariffs on processed goods in such a way that processing will expand in the LDCs but not contract in the DCs—that is, to give DC policymakers an easier choice than is provided by suggestions that they unilaterally reduce their import duties.

II. Purpose of the Paper

In this paper we will estimate and compare the magnitudes and effects of LDC export taxes with those of DC import tariffs. Of particular interest are the effects on the amounts of processing performed in LDCs and DCs and on the levels of trade of primary and processed commodities.

In order to estimate such effects, it was necessary to construct a model capable of isolating them. While tariff escalation is usually studied by calculating effective rates of protection, the effective-rate concept breaks down when the small-country assumption is dropped. In the context of north-south trade in commodities such as cotton and coffee, it is clearly not tenable to assume that either side is too small to influence world prices. Thus the model we developed is capable of determining resource flows and trade patterns without assuming that either the DCs or the LDCs take world prices as given.

The point of this analysis is to suggest the possibility of the *simultaneous* reduction of LDC export taxes on primary commodities and DC import tariffs on processed commodities. Unfortunately, sympathy for improving the economic lot of the poorer countries has become almost synonymous with voicing demands for unilateral concessions by the developed world. But while this "confrontation" has produced an acrimonious north-south dialogue, few substantive changes in economic policy have resulted. If areas of common interest between LDCs and DCs can be found, and if their benefits can be shown to be large relative to the LDC gains from unilateral gifts, perhaps the north-south dialogue can be diverted toward a more constructive path. Reductions of DC tariffs and LDC export taxes on raw and processed commodities is one such avenue of mutual interest.

III. The Model

The analysis is intended to capture the effects of the export taxes and import tariffs on the levels of production and of processing in LDCs and in DCs and the effects on exports of primary and processed goods from the LDCs. The model we have constructed is similar to the fixed coefficient, partial-equilibrium model used by Finger (1976*b*) to analyze the offshore assembly provisions in the U.S. tariff. It is based on six behavioral relationships: demands in the DC and the LDC for the "finished" or "processed" good,[1] and supplies in the DC

[1] "Finished" is, of course, relative to the process being studied. Whether the processed good is demanded by final consumers or by manufacturers who use it as an input is irrelevant for our purposes.

and in the LDC of the primary good and of processing. The "quantity of processing" is defined conceptually as the quantity of primary goods processed, and the supply of processing relates this quantity to the unit rate of return to the processing activity—to the difference between the price paid for a unit of the primary good and the price received for that unit when it is sold in processed form.

Notation

As usual, P's are prices and Q's are quantities; T is one plus the ad valorem tariff rate in the importing (developed) country and X is one plus the ad valorem export tax rate in the exporting (developing) country; D's represent demand and S's supply, while Φ's are supply elasticities and Γ's are demand elasticities (defined so as to be negative for downward-sloping demand curves). Subscripts n (for north) and s (south) distinguish between the DC importer and the LDC exporter while b, c, and g distinguish among the primary good (e.g., beans), the processed good (e.g., coffee), and the processing activity (e.g., grinding).

The DC and LDC shares of consumption of the processed good are Rnc and Rsc, while Rsb, Rsg, Rnb, and Rng are DC and LDC shares of world output of the primary good and of processing and Vs is value added by processing as a porportion of the value of the processed good, evaluated in the LDC [$Vs = Psg/(Psg + Psb)$]. For convenience, define A as the reciprocal of V.

The production function for the processed good is assumed to be subject to fixed coefficients with the units defined in such a way that to produce one unit of the processed good requires one unit of the primary good and one unit of processing. The function may thus be written

$$Qc = \min(Qb, Qg). \tag{1}$$

The same production function is assumed to apply in the DC and in the LDC.

The specification of the supply and demand functions follows the usual partial-equilibrium practice of excluding all variables except own price. Hence, $Dnc = Dnc(Pnc)$, $Ssb = Ssb(Psb)$, etc.

When the DCs impose import duties and the LDCs impose export taxes on the primary and processed goods, the following relationships hold between prices:

$$Pnb = Tb \cdot Xb \cdot Psb, \tag{2}$$

$$Pnc = Tc \cdot Xc \cdot Psc. \tag{3}$$

By definition,

$$Psg = Psc - Psb, \tag{4}$$

and

$$Png = Pnc - Pnb. \tag{5}$$

At equilibrium, world (DC plus LDC) quantities demanded and supplied of the processed good are equal. With quantity units defined so that one unit of processing and one unit of the primary good are required per unit of the processed good, at equilibrium world quantities supplied of all three are equal. Thus equation (6) defines Q as world quantity demanded of the processed good and equations (7) and (8) express the equilibrium conditions:

$$Q = Dnc + Dsc \tag{6}$$

$$Q = Snb + Ssb \tag{7}$$

$$Q = Sng + Ssg \tag{8}$$

The complete model consists of the equilibrium conditions (7) and (8), the definitions (4), (5), (6), the price equations (2) and (3), two demand functions (for the processed good in DC and LDC), and four supply functions (of processing and of primary goods from both DC and LDC). The corresponding variables are Pnb, Pnc, Png, Psb, Psc, Psg, and their corresponding Q's, plus total quantity, Q, defined in equation (6).

When we substitute the demand and supply functions into (6), (7), and (8), and then use equations (2), (3), (4), and (5) to eliminate Pnb, Png, and Pnc, we can express the model as

$$Q = Dnc(Tc \cdot Xc \cdot Psc) + Dsc(Psc) \tag{9}$$

$$Q = Snb(Tb \cdot Xb \cdot Psb) + Ssb(Psb) \tag{10}$$

$$Q = Sng(Tc \cdot Xc \cdot Psc - Tb \cdot Xb \cdot Psb) + Ssg(Psc - Psb). \tag{11}$$

Conceptually, these three equations can be solved for equilibrium value of Q, Psb, and Psc. Substitution into (2), (3), (4), and (5) gives equilibrium values for the other price variables. Substitution of the prices into the demand and supply functions determines quantities consumed (of the finished good) and produced (of primary goods and of processing) in the DC and the LDC.

The LDCs export both the final and intermediate goods to the DCs. Let E represent quantity of exports and W value of exports. The price received by the exporting LDC includes the export tax, so the value of exports may be written

$$W = Wb + Wc = Eb \cdot Psb \cdot Xb + Ec \cdot Psc \cdot Xc. \tag{12}$$

IV. Comparative Statics

The following definitions will be used to simplify the expressions for the effects on the endogenous variables of changes of the policy parameters. (Asterisked variables represent proportional changes.)

$$\Gamma = Rnc \cdot \Gamma n + Rsc \cdot \Gamma s \tag{13}$$

$$\Phi b = Rnb \cdot \Phi nb + Rsb \cdot \Phi sb \tag{14}$$

$$\Phi g = Rng \cdot \Phi ng + Rsg \cdot \Phi sg \tag{15}$$

$$Z\overset{*}{c} = T\overset{*}{c} + X\overset{*}{c} \tag{16}$$

$$Z\overset{*}{b} = T\overset{*}{b} + X\overset{*}{b}. \tag{17}$$

In addition, we evaluate the expressions at the free trade equilibrium, that is, at the point at which $Tc = Xc = Tb = Xb = 0$. At this point A, the reciprocal of the value-added coefficient, is the same when measured in the exporting country (LDC) or in the importing country, that is,

$$A = As = An. \tag{18}$$

After totally differentiating, taking proportional changes, and substituting from (12) through (17),

$$Q^* = \Gamma \cdot P\overset{*}{sc} + Rnc \cdot \Gamma n \cdot Z\overset{*}{c} \tag{19}$$

$$Q^* = \Phi b \cdot P\overset{*}{sb} + Rnb \cdot \Phi nb \cdot Z\overset{*}{b} \tag{20}$$

$$\begin{aligned} Q^* = A \cdot \Phi g \cdot P\overset{*}{sc} - (A - 1) \cdot \Phi g \cdot P\overset{*}{sb} + A \cdot Rng \cdot \Phi ng \cdot Z\overset{*}{c} \\ - (A - 1) \cdot Rng \cdot \Phi ng \cdot Z\overset{*}{b}. \end{aligned} \tag{21}$$

From (2) and (3) we know that

$$P\overset{*}{nb} = P\overset{*}{sb} + Z\overset{*}{b} \tag{22}$$

$$P\overset{*}{nc} = P\overset{*}{sc} + Z\overset{*}{c}. \tag{23}$$

Solution

When we solve (19)–(21) simultaneously, and substitute into (22) and (23), we obtain

$$\begin{aligned} Q^* = {} & Z\overset{*}{c} \cdot [\Phi ngRngA\Gamma sRsc - \Phi sgRsgA\Gamma nRnc]\Phi b/den \\ & + Z\overset{*}{b} \cdot [\Phi nbRnb\Phi sgRsg(A-1) - \Phi sbRsb\Phi ngRng(A-1)]\Gamma/den \end{aligned} \tag{24}$$

$$\begin{aligned} P\overset{*}{sc} = {} & Z\overset{*}{c} \cdot [\Phi b(-\Gamma nRnc + \Phi ngRngA) - \Phi g(A-1)\Gamma nRnc]/den \\ & + Z\overset{*}{b} \cdot [\Phi nbRnb\Phi sgRsg(A-1) - \Phi sbRsb\Phi ngRng(A-1)]/den \end{aligned} \tag{25}$$

$$\begin{aligned} \overset{*}{Psb} &= \overset{*}{Zc}\cdot[\Phi ngRngA\Gamma sRsc-\Phi sgRsgA\Gamma nRnc]/den \\ &\quad + \overset{*}{Zb}\cdot[-\Gamma(\Phi nbRnb+\Phi ngRng(A-1)+\Phi gA\,\Phi nbRnb]/den \end{aligned} \tag{26}$$

$$\begin{aligned} \overset{*}{Pnc} &= \overset{*}{Zc}\cdot[\Phi b(\Gamma sRsc-\Phi sgRsgA)+\Phi g(A-1)\Gamma sRsc]/den \\ &\quad + \overset{*}{Zb}\cdot[\Phi nbRnb\Phi sgRsg(A-1)-\Phi sbRsb\Phi ngRng(A-1)]/den \end{aligned} \tag{27}$$

$$\begin{aligned} \overset{*}{Pnb} &= \overset{*}{Zc}\cdot[\Phi ngRngA\Gamma sRsc-\Phi sgRsgA\Gamma nRnc]/den \\ &\quad + \overset{*}{Zb}\cdot[\Gamma(\Phi sbRsb+\Phi sgRsg(A-1)-\Phi gA\,\Phi sbRsb]/den \end{aligned} \tag{28}$$

where $den = -\Phi b\Phi gA+\Gamma\Phi g(A-1)+\Gamma\Phi b$.

Analogous expressions for $\overset{*}{Psg}$ and $\overset{*}{Png}$ can be obtained by recalling that $Psg = Psc - Psb$ and $Png = Pnc - Pnb$, which implies

$$\overset{*}{Psg} = A\cdot\overset{*}{Psc} - (A-1)\cdot\overset{*}{Psb} \tag{29}$$

$$\overset{*}{Png} = A\cdot\overset{*}{Pnc} - (A-1)\cdot\overset{*}{Pnb}. \tag{30}$$

Evaluation

We assume that supply curves slope upward (all Φ's positive) and demand curves slope downward (Γ's negative). (Note that *den* therefore is negative.) Downward-sloping demand curves imply that the sign of the effects on quantity consumed in the DCs and the LDCs will be the opposite of the sign of the effects on *Pnc* and *Psc*, respectively. Also, upward-sloping supply curves imply that the sign of the effects on output of the primary good or on the level of processing in each country will be the same as the sign of the effect on the appropriate price.

Prices and Quantities

As intuition suggests, export taxes and tariffs on the processed good (*Zc*) raise its price in the importing and lower its price in the exporting countries. Similarly, the export taxes and tariffs on the primary good (*Zb*) raise its price in the importing DCs and lower its price in the exporting LDCs. Also, taxes on international sales of the processed good protect processing in importing countries and retard it in exporting countries, while trade taxes on the primary good have the opposite effect.

The cross-effects and the effects on total consumption do not fall into place so readily. Intuitively, one would reason that a tax on international trade in the finished good would reduce its consumption. This would reduce (derived) demand for the primary good,

forcing down its price, both in the LDCs and the DCs.[2] Likewise, we would expect a trade tax on the primary good to raise the overall cost and hence reduce consumption of the finished good. With less consumption of the finished good, demand for and hence the rate of return to processing are depressed.

While a priori knowledge suggests that these intuitive notions will probably be correct, it does not exclude the possibility of paradoxical results. Upon closer examination of equations (24), (26), and (28), we note that each of $\partial Q/\partial Zc$, $\partial Psb/\partial Zc$, and $\partial Pnb/\partial Zc$ will be negative, when

$$|\Phi sgRsgA\Gamma nRnc| > |\Phi ngRngA\Gamma sRsc|, \tag{31}$$

zero when the two terms are equal, and positive when the inequality is reversed. Thus the cross-effects will be paradoxical ($\partial Psb/\partial Zc$ and $\partial Pnb/\partial Zc$ positive) only when the consumption effect is paradoxical ($\partial Q/\partial Zc$ is positive).

While the signs of the elasticities do not assure that inequality (31) will hold, there is reason to presume that it will. As the DCs are importers of the processed good, not all of DC consumption is processed in the DCs, that is, $Sng/Dn < 1$. In the exporting LDCs, all of local consumption plus some goods for export are processed at home, that is, $Ssg/Dsc > 1$. From this we have $Dnc/Sng > Dsc/Ssg$ or $Dnc/Q \cdot Ssg/Q > Dsc/Q \cdot Sng/Q$, which means that $Rnc \cdot Rsg > Rsc \cdot Rng$. Thus, unless there is some basis for arguing that the elasticity of demand for the finished good is higher and/or the elasticity of supply of the processing activity is lower in LDCs than in DCs, the presumption would be that trade taxes on the finished good reduce total consumption and depress the price and output of the primary good in both the exporting and the importing country.

Similarly, the effect of primary-good trade taxes on total consumption "should" be negative and on the price of the finished good "should" be positive. Equations (24), (25), and (27) indicate that this will be the case if

$$\Phi sbRsb\Phi ngRng(A-1) > \Phi nbRnb\Phi sgRsg(A-1). \tag{32}$$

That LDCs export the primary good implies $Rng \cdot Rsb > Rsg \cdot Rnb$, hence, inequality (32) will hold unless the elasticity of supply of the primary good is considerably lower and/or the elasticity of supply of processing considerably higher in LDCs than in DCs.

[2] From eq. (2) we know that changing the trade tax on the finished good will have the same proportionate effect on Pnb as on Psb.

Value of LDC Exports

Equation (12), which specifies the value of LDC export receipts, can be rewritten as

$$W = (Ssb - Ssg)PsbXb + (Ssg - Dsc)PscXc. \tag{33}$$

The intention of an LDC export tax on a primary good is to increase earnings from raw materials exports by exploiting monopsony power in the market for the primary good and/or to earn more on processed exports by shifting foreign demand to processed forms of the good. While the results reported in table 2 indicate that $PsbXb$ will rise when Xb is imposed, the quantity exported will decline, especially if Φnb is large. Looking at the second term of the right side of equation (33), we note that while Xb will cause Ssg to increase, it could cause Psc to fall and Dsc to rise, and hence could reduce the value of exports of the finished good. Thus, while an export tax on the primary good will likely increase LDC export receipts, the perverse result is possible.

Similar analysis indicates that an export tax on the finished good might reduce LDC export earnings, both on exports of the finished and/or on exports of the primary good. Likewise import tariffs would probably, but not necessarily, reduce LDC export revenue.

V. Estimated Effects

Data

The calculation of the impact of export taxes and tariffs requires values for input coefficients, share parameters, and elasticities.[3] In addition, the trade and production effects use 1973 trade flows (OECD 1973) and production levels (FAO 1976) as the base. The share parameters are shares of production and consumption of the LDCs and DCs with these two comprising the world (i.e., the centrally planned bloc is excluded). The elasticity terms were in part based on estimates of commodity experts and in part are simply educated guesses. Estimated changes are expressed as proportions of the "with tariffs, with export taxes" values. The formulas used to make the

[3] We are indebted to A. J. Yeats for providing the input coefficients for all products except soluble coffee and cocoa butter. For these two, the coefficients were derived from the conversion factors used by the coffee and cocoa agreements. The share parameters were obtained from the FAO, which provided figures on production and consumption of the raw material. For the other stages of the process, the share parameters were obtained by adding or deducting trade flows from the raw-material figures. The elasticity estimates are $\Phi nb = \Phi sb = 0.5$; $\Phi sg = 10\ \Phi ng = 1$; $\Gamma s = \Gamma n = 0.4$ for cocoa and copra; $\Gamma s = \Gamma n = 0.6$ for rubber, wood, leather, and soluble coffee; $\Gamma s = \Gamma n = 1$ for cotton and wool. Sensitivity analysis is reported in the Appendix.

TABLE 2

SUMMARY OF COMPARATIVE STATICS RESULTS

POLICY PARAMETER	VARIABLES					
	∂Pnc	∂Psc	∂Pnb	∂Psb	∂Png	∂Psg
∂Zc	+	−	Uncertain but probably negative*	Uncertain but probably negative*	+	−
∂Zb	Uncertain but probably positive†	Uncertain but probably positive†	+	−	−	+

* $\partial Pnb/\partial Zc$ and $\partial Psb/\partial Zc$ will have the same sign.
† $\partial Pnc/\partial Zb$ and $\partial Psc/\partial Zb$ will have the same sign.

calculations were similar to equations (24)–(30) but did not reflect the simplifying assumption that T's and X's were initially zero.

Results

Several experiments were performed: the DC import taxes were removed while holding the LDC export taxes constant, the export taxes were removed while holding the import taxes constant, and both trade taxes were eliminated simultaneously. The effects on production, consumption, and trade are presented in tables 3, 4, and 5. The sensitivity analysis reported in the Appendix shows that the results are quite robust with respect to variations in supply and demand elasticities.

The DC Tariffs

The DC tariffs are intended to protect DC processors, and removal of these tariffs would increase processing in the LDCs and reduce it in the DCs (table 3). Liberalization entails increased final consumption in the north, lower consumption in the south, but increased consumption overall and hence increased raw material production for both "countries." The "shifting" of processing from DCs to LDCs is much more pronounced than is the "market-expansion" effect. The LDC export earnings would increase especially sharply on cotton, wool, and leather, and over the eight commodities would increase by about 16 percent.

The LDC Export Taxes

Repeal of the LDC export taxes alone would retard LDC processing of each of the commodities except leather, in which case the export-tax escalation is not steep enough to protect leather tanning[4] (table 4).

Elimination of export taxes has the expected result of increasing LDC raw-material production and lowering DC raw-material production. For some commodities, liberalization causes world final consumption to decline (cotton, wool, and wood).[5] In most cases, LDC foreign exchange receipts fall after export-tax elimination.

Export and Import Taxes

Estimates presented in table 5 indicate that if LDC export and DC import taxes were simultaneously eliminated LDC processing of six of

[4] The export-tax escalation required to protect LDC value added depends on the input coefficient of the raw material in the finished good.

[5] The theoretical possibility of such counterintuitive results was discussed in Sec. III.

TABLE 3

CONSUMPTION, PRODUCTION, AND TRADE EFFECTS OF REMOVING DC TARIFFS

COMMODITY*	FINAL CONSUMPTION (% Change)			PRIMARY PRODUCTION (% Change)		PROCESSING (% Change)		LDC EXPORT REVENUE	
	World (LDC + DC)	LDC	DC	LDC	DC	LDC	DC	Value†	(% Change)
Copra	1.1	−.8	2.8	1.1	‡	16.9	−43.9	24.8	6.2
Rubber	1.7	−1.8	2.5	1.7	‡	28.1	−5.7	74.8	6.3
Cocoa	1.7	−1.5	2.1	1.7	‡	52.0	−16.0	103.6	11.3
Cotton	2.0	−3.5	5.5	2.1	1.8	23.1	−17.4	803.9	42.3
Wool	2.3	−6.5	3.7	2.8	2.2	75.6	−11.6	73.2	36.6
Leather	1.2	−1.2	2.6	1.2	1.2	17.9	−11.0	320.4	39.6
Wood	.1	−.5	.2	.1	.1	15.6	−1.0	129.0	4.0
Coffee	1.6	−3.3	1.7	1.6	‡	79.5	−5.2	85.8	6.9
Total§	.7	−2.2	1.2	1.3	.4	23.0	−3.8	1,615.5	16.3

* See table 1 for names of the primary and processed varieties.
† $ millions, 1973 base.
‡ No primary production in developed countries.
§ Except for the "value" column, these are averages of the product-by-product figures weighted by values of the variables listed in that row.

TABLE 4

CONSUMPTION, PRODUCTION, AND TRADE EFFECTS OF REMOVING DC EXPORT TAXES

COMMODITY*	FINAL CONSUMPTION (% Change)			PRIMARY PRODUCTION (% Change)		PROCESSING (% Change)		LDC EXPORT REVENUE	
	World (LDC + DC)	LDC	DC	LDC	DC	LDC	DC	Value†	(% Change)
Copra	.5	−.3	1.2	.5	‡	−.6	3.5	−11.0	−2.7
Rubber	.1	.1	.1	.1	‡	−2.8	.9	−64.3	−5.4
Cocoa	1.5	−.3	1.8	1.5	‡	−53.8	21.0	−178.9	−19.4
Cotton	−.7	−.7	−.7	1.1	−4.2	−15.0	12.4	−274.1	−14.4
Wool	−1.0	−1.0	−1.0	2.9	−2.3	−42.0	6.8	−7.4	−3.7
Leather	.8	−3.6	3.4	5.6	−3.9	7.0	−3.7	275.2	34.0
Wood	−.1	−2.3	.0	4.3	−.8	−29.2	2.1	29.9	.9
Coffee	2.8	−.6	2.9	2.8	‡	−42.0	6.7	−182.2	−14.7
Total§	.0	−1.6	.3	2.7	−1.3	−14.7	2.9	−412.7	−4.2

* See table 1 for names of the primary and processed varieties.
† $ millions, 1973 base.
‡ No primary production in developed countries.
§ Except for the "value" column, these are averages of the product-by-product figures weighted by values of the variables listed in that row.

TABLE 5

CONSUMPTION, PRODUCTION, AND TRADE EFFECTS OF REMOVING DC TARIFFS AND LDC EXPORT TAXES

	FINAL CONSUMPTION (% Change)			PRIMARY PRODUCTION (% Change)		PROCESSING (% Change)		LDC EXPORT REVENUE	
COMMODITY*	World (LDC + DC)	LDC	DC	LDC	DC	LDC	DC	Value†	(% Change)
Copra	1.5	−1.1	4.1	1.5	‡	16.3	−40.4	13.8	3.5
Rubber	1.9	−1.6	2.6	1.9	‡	25.4	−4.8	10.4	.9
Cocoa	3.2	−1.9	3.9	3.2	‡	−1.8	4.9	−75.3	−8.2
Cotton	1.3	−4.2	4.8	3.3	−2.4	8.1	−5.0	529.9	27.9
Wool	1.3	−7.6	2.6	5.7	−.2	33.6	−4.9	65.9	32.9
Leather	1.9	−4.8	6.1	6.8	−2.7	24.9	−14.7	595.5	73.5
Wood	.0	−2.8	.2	4.4	−.7	−13.6	1.1	158.9	4.9
Coffee	4.4	−3.8	4.5	4.4	‡	37.5	1.5	−96.4	−7.8
Total§	.7	−3.8	1.5	4.0	−.9	8.3	−.9	1,202.8	12.1

* See table 1 for names of the primary and processed varieties.
† $ millions, 1973 base.
‡ No primary production in developed countries.
§ Except for the "value" column, these are averages of the product-by-product figures weighted by values of the variables listed in that row.

the eight commodities would increase, while DC processing of five of the eight would decline. The striking declines of DC processing are in copra and leather—declines of 40 and 15 percent, respectively. But the value added in DC processing of hides and copra is unimportant relative to the processing of other commodities; hence, the aggregate result is a decline of processing in DCs of less than 1 percent. On the plus side, processing in the LDCs would increase by more than 8 percent—a substantially larger percentage increase than the less than 1 percent decline in the DCs. This is in part because LDC processing starts from a lower base (less than one-quarter of DC processing activity), so that a given shift of processing volume from north to south generates a small percentage loss in the DCs and a large percentage increase in the LDCs. More important, liberalization increases total world final consumption and, hence, the size of the processing pie. The DC loss of processing accounts for less than half of the LDC increase—the larger part coming from the expansion of the world processing pie. If, instead, tariffs were unilaterally lowered, three-fourths of the LDC processing gain is a transfer from the DCs with only one-fourth due to expansion of the market.

Liberalization of export taxes and tariffs also stimulates raw-material production in the LDCs and retards it in the DCs.[6] As is the case for processing, the LDC gain exceeds the DC loss. The DCs do not produce four of the eight raw materials.

The 8 percent increase in the level of processing in the LDCs amounts, at 1973 prices and based on 1973 levels of activity, to about $1.2 billion. On the same basis, the 4 percent increase of production in the LDCs of these primary products comes to about $0.9 billion. Because "world" production and processing of commodities rise, the corresponding declines in the DCs are about one-third as large as the volume increases in the LDCs.

The effect of liberalization on LDC export earnings is not positive for all commodities, but overall the estimated increase is in excess of $1 billion. As policy alternatives to increase LDC export earnings go, this is a significant impact. Tariff preferences, by comparison, are estimated to have increased LDC exports (including trade diverted from DCs) by less than $500 million—and even under the most optimistic scenario of a Generalized System of Preferences (GSP) without value limits and with expanded product, coverage would expand LDC export earnings (again including exports diverted from DCs) by only $772 million (Baldwin and Murray 1977, p. 37).

The large increase in trade which would result from the liberaliza-

[6] Thus, the net effect of the LDC export and DC import taxes combined is to protect processing *and* primary production in the DCs.

tion considered here reflects the importance of primary and processed commodities in north-south trade and the high levels of tariffs and export taxes. Furthermore, we have considered only eight commodities.[7] When extended to others, particularly minerals such as phosphates and metals, the trade benefits would be much larger.

VI. Conclusion: The Case for Liberalization

The export taxes in the developing countries and the import taxes in the developed countries are designed to protect local processors of primary commodities. For the eight-commodity sample studied here, the export and import taxes together have the effect of slightly increasing DC processing activity, but the main effect is to reduce the size of the processing pie. In contrast to the effects of unilateral reduction by the DCs of their import taxes, simultaneous elimination of LDC export taxes and DC tariffs involves a minimal reduction of DC processing activity and is hence more likely to be acceptable to DC policymakers.

Such a reciprocal liberalization would involve gains to both north and south. The gains to the DCs accrue in the form of lower consumer prices and increased consumption. For the LDCs, in addition to increased processing, liberalization entails greater primary production and expanded foreign exchange receipts.

While the increases of the level of LDC processing and of export earnings would be very attractive to LDC policymakers, the policy move examined here would also reduce LDC consumption of processed goods and eliminate the revenue LDC governments collect through export taxes. The decline of LDC consumption is not likely to be weighted very heavily by most LDC governments relative to the processing gain and increased foreign exchange receipts. But their fiscal systems may not be sufficiently developed to provide them with alternative sources of revenue. If this is a serious problem, negotiations might focus on other protective devices employed by LDCs.

Commodity trade, under steady multilateral rules and in open, competitive markets, could provide LDCs with the benefits of economic efficiency while also advancing their objectives of national self-determination and the avoidance of playing a dependent's role in international relations (Diaz-Alejandro 1975, p. 225). More generally, the liberalization of commodity trade is only one avenue of mutual interest that developed and developing countries might explore. The effects of the Dillon and Kennedy Rounds of tariff reductions dem-

[7] The eight, including their processed forms, accounted for 11.5 percent of LDC export value in 1973.

TABLE A1

ESTIMATES OF EFFECTS OF REMOVING LDC EXPORT TAXES AND DC TARIFFS WITH VARIOUS SUPPLY AND DEMAND ELASTICITY VALUES

	Final Consumption (% Change)			Primary Production (% Change)		Processing (% Change)		LDC Export Revenue	
Scenario	World (LDC & DC)	LDC	DC	LDC	DC	LDC	DC	Value*	% Change
Base case†	.7	−3.8	1.5	4.0	−.9	8.3	−.9	1,202.8	12.1
$\Phi sg = \Phi ng = 1$‡	.4	−4.5	1.2	3.5	−1.0	4.2	−.3	915.8	9.2
Γnc & Γsc halved	.4	−1.7	.8	3.5	−1.0	7.4	−1.0	722.7	7.3
Γnc & Γsc doubled	.9	−8.3	2.5	4.6	−.8	9.4	−.8	2,003.4	20.2
$\Phi sb = \Phi nb = .3$	.5	−4.0	1.3	2.7	−.5	7.7	−.9	1,079.9	10.9
$\Phi sb = \Phi nb = .8$	.8	−3.5	1.6	5.8	−1.6	8.9	−.9	1,428.8	14.4

* $ millions, 1973 base.

† Base case $\Phi nb = \Phi sb = 0.5$, $\Phi ng = 1$, $\Phi sg = 10$, $\Gamma c = 1$ (cotton, wool), $\Gamma c = 0.6$ (coffee, rubber, leather, wood), $\Gamma c = 0.4$ (cocoa, copra).

‡ Each scenario consists of varying the listed elasticities only, holding the others at their base case value.

onstrate that LDCs have benefited from trade liberalization aimed primarily at interdeveloped country trade (Finger 1974, 1976*a*). A conscious effort to locate and implement policies of mutual benefit to DCs and LDCs could make a far more important contribution to LDC development than futile demands for unilateral concessions. Substantive LDC involvement in multilateral negotiations can play a part in creating a more stable and less asymmetrical international economic order.

Appendix

Sensitivity Analysis of Elasticity Values

The parameter values on which the results in the text are based are those which we feel are the "central tendencies" of available estimates. Our primary source of information on the parameter values was the opinion of World Bank commodities experts and U.S. Treasury commodity desk officers. Several estimates of elasticities of primary product supply and of demand for the processed good are available, but we found no direct estimates of the elasticity of the supply of processing. Hence values for this parameter are more a matter of expert opinion.

Table A1 presents the effects of varying the supply and demand elasticities on the main conclusions of the paper. The rows of table A1 correspond to the last row of table 5, that is, they reveal the effects of removing both LDC export taxes and DC tariffs on all eight commodities. Five variations from the base case are reported. (1) The LDC processing supply elasticity is lowered from 10 to 1 (i.e., set equal to the DC processing supply elasticity), (2) the demand elasticities are halved, (3) the demand elasticities are doubled, (4) the common primary supply elasticity is lowered from 0.5 to 0.3, (5) the primary supply elasticity is raised to 0.8.

The results indicate that the main conclusions of the paper are quite robust. In all cases, simultaneous elimination of trade taxes increases the percentage rate of growth of LDC processing while causing a much smaller percentage decline in DC processing.

Halving the demand elasticities reduces the trade gains considerably, to $723 million, but even this figure exceeds, by over $200 million, Baldwin's and Murray's estimate of the trade expansion of GSP.

The other results are also intact. In each case, world final consumption increases, LDC consumption decreases, DC consumption increases, LDC primary production increases, and DC primary production decreases as a result of liberalization.

References

Balassa, Bela. "The Structure of Protection in Industrial Countries and Its Effects on the Exports of Processed Goods from the Developing Countries." In *Kennedy Round Estimated Effects on Tariff Barriers*, by Secretary General, UNCTAD. New York: United Nations, 1968.

Baldwin, R. E., and Murray, T. "MFN Tariff Reductions and Developing Country Trade Benefits under the GSP." *Econ. J.* 87 (March 1977): 30–46.

Diaz-Alejandro, Carlos F. "North-South Relations: The Economic Component." In *World Politics and International Economics*, edited by C. Fred Bergsten and Lawrence B. Krause. Washington: Brookings Inst., 1975.

Finger, J. M. "GATT Tariff Concessions and the Exports of Developing Countries." *Econ. J.* 84 (September 1974): 566–75.

———. "Effects of the Kennedy Round Tariff Concessions on the Exports of Developing Countries." *Econ. J.* 86 (March 1976): 87–95. (*a*)

———. "Trade and Domestic Effects of the Offshore Assembly Provision in the U.S. Tariff." *A.E.R.* 66 (September 1976): 598–611. (*b*)

Organization for Economic Cooperation and Development (OECD). *Statistics of Foreign Trade, Trade by Commodities, Market Summaries: Imports.* Ser. C. Paris: OECD, 1973.

United Nations Food and Agriculture Organization (FAO). *Commodity Review and Outlook.* Rome: United Nations, 1976.

United States Government. "Export Taxes." An interagency report on export restrictions prepared for submission to the GATT as a background paper for the ongoing Tokyo Round multilateral trade negotiations, pt. 4, sec. G. Mimeographed. Washington: Dept. Treasury, 1976.

Yeats, A. J. "Effective Tariff Protection in the United States, the European Economic Community, and Japan." *Q. Rev. Econ. and Bus.* 14 (Summer 1974): 41–50.

———. "Effective Protection for Processed Agricultural Commodities: A Comparison of Industrial Countries." *J. Econ. and Bus.* 29 (Fall 1976): 31–39.