PHILIPPINE EXPORT AND TERMS OF TRADE

INSTABILITY, 1965-1982

by

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Export and terms of trade instability results in
uncertainty and expectational surprises and errors. Further-
more, since external shocks can not be totally sterilized,
domestic sectoral and aggregate production, income and
prices are affected although usually at a lesser extent. It
is generally considered that such instability is distort-
ionary. It is in this regard that export instability is an
important determinant of the demand for international
reserves. Indeed, the role of the international reserves
and to some extent of external credit availability is to
provide some liquidity buffer against export and terms of
trade instability, and thereby tempering the impact of
external shocks on the domestic economy. Otherwise, when
there is negligible foreign exchange reserves, a sharp dete-
rioration in the commodity terms of trade could readily
cause a payments crisis; e.g., during 1920 and 1921 in the
Philippines (see Intal, 1983).

The world economy was more unstable during the seventies than during the previous two decades. This is reflected in the Philippine foreign trade experience. Table 1 presents two measures of instability of export and import indices of the Philippines for the periods 1952-1964 and 1963-1982. One measure of instability is the standard error of the estimate of the trend equation $\ln X = a + b$ time $+ u_t$, shown in Table 1 as S_1. The second measure of instability (S_2) is equal to S_1 divided by the logarithm of the mean value of X where X stands for any variable; this measure facilitates comparison across distributions with different means (see Branson and Papaefstratiou, 1979).

The table shows that the instability of aggregate export earnings rose by 50 percent during 1965-1982 as compared to the period 1952-1964. This rise in export earnings instability appear to be caused by the 200 percent rise in export price instability. Similar pattern of instability characterizes aggregate imports. Because of the sharp rise in the instability of export and import prices, the instability of the commodity terms of trade substantially increased also during the period. The instability of export and import volumes and of the income terms of trade during 1965-1982 is comparable to the period 1952-1964.

Aggregate export and terms of trade instability depend upon the variability of the constituent commodity prices and

Table 1. Measures of Instability of Aggregate Export and Import
Indices, 1952-1964 and 1965-1982.

| | S_1* | | S_2** | |
	1952-1964	1964-1982	1952-1964	1964-1982
I. Export Indices				
Value	.078	.16	.02	.03
Volume	.067	.093	.02	.02
Price	.063	.172	.01	.03
II. Import Indices				
Value	.079	.189	.02	.03
Volume	.097	.080	.02	.02
Price	.042	.157	.01	.03
III. Commodity Terms				
of Trade	.068	.093	.01	.02
IV. Income Terms				
of Trade	.073	.086	.02	.02

*S_1 is the standard error of the estimate of the log
trend equation $\ln X = a + bt + U_t$.

**S_2 is S_1 divided by the logarithm of the mean of the
variable.

Source of basic data: Central Bank Statistical Bulletin;
Central Bank Department of Economic Research.

quantities. In the light of the sharp rise in instability during the seventies, it is worthwhile to look into the contributions of the constituent commodities to the overall instability. This paper looks more closely into export and terms of trade instability through decomposition analysis and explores commodity diversification in relation to instability.

DECOMPOSITION ANALYSIS OF INSTABILITY

Decomposition analyses of instability usually consider fluctuations around a trend (see, e.g., Lloyd and Procter, 1983; Bautista, 1983). Given $Z = X.Y$, the variance of Z is approximated by the variance of X and Y plus the covariance between X and Y. Given $Z = X/Y$, the variance of Z is approximated by the sum of the variances of X and Y minus twice the covariance between X and Y. When the aggregate indices are decomposed into their commodity constituents, the commodity variances and covariance are weighted by the respective value shares. For example, the variance of the aggregate commodity terms of trade (t) around a trend can be approximated by (see Lloyd and Procter, 1983):

$$(1) \quad \mathrm{Var}(t) = \sum_i (w_i^2 \frac{\bar{t}_i^2}{\bar{t}^2}) \, \mathrm{var}(t_i) + \sum_j \sum_{i \neq j} (\frac{w_j w_i \bar{t}^2}{\bar{t}_i \bar{t}_j}) \, \mathrm{cov}(t_i, t_j)$$

where:

w_i = value weight of commodity i

t = aggregate commodity terms of trade

t_i = individual commodity terms of trade

$\bar{t}$ = mean value of the aggregate commodity terms of trade

$\bar{t}_i$ = mean value of the individual commodity terms of trade.

which, if t and the t_is are the ratios of actual to trend estimated values (so much so that the mean values are equal to unity), can be rewritten into:

$$(2)\ \text{Var}(t) = \sum_i w_i^2 \text{var}(t_i) + \sum_j \sum_{i \neq j} w_i w_j \text{cov}(t_i, t_j)$$

Table 2 presents the decomposition of the variance of the ratios of the actual to predicted values of the aggregate indices of export earnings and commodity terms of trade for both the aggregate indices and for the principal traditional exports during 1965-1982. The results indicate that variation in export prices is the key overriding contributor to the variation in export earnings. The decomposition results on the aggregate commodity terms of trade are instructive. First, the variation in export prices or import prices alone more than accounts for the variation in the commodity terms of trade. This reflects essentially

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Table 2. Decomposition of the Variance of the Ratios of
Actual to Predicted Values of Export Earnings
and Commodity Terms of Trade, 1965-1982.

| | CONTRIBUTION DUE TO | | | |
	Variation in Export Price Index Alone	Variation in Import Price Index Alone	Variation in Export Volume Index Alone	Inter-action Term
I. Export Earnings				
A. Aggregate				
Actual	.00110		.00036	-.00046
% of Variation of export earnings[*]	91.7		33.3	-25.0
B. Traditional				
Actual	.00155		.00055	.00076
% of Variation of export earnings[*]	115.8		41.0	-56.8
II. Commodity Terms of Trade				
A. Aggregate				
Actual	.00110	.00097		-.00172
% of Variation of C-TOT[*]	314.3	227.1		-491.4
B. Traditional				
Actual	.00155	.00097		-.00198
% Variation of C-TOT	287.0	179.6		-366.6

[*] The variance used as denominator is the approximate
value, not the directly computed variance. The approximate value is
the sum of the variance and twice the covariance of the constituent parts.

Note: The variances and covariances above are the variances and
covariances of the ratios of the actual to the estimated
values of the logarithms of the variables.

that either export prices or import prices fluctuated more than the commodity terms of trade. Second, and more importantly, the contribution of the interaction term is larger than either that of export prices alone or that of import prices alone. This may suggest that there are leads and lags in the changes in the world demand for products which the Philippines exports as compared to the world demand for the mainly raw material and capital goods which the Philippines imports. The leads and lags, or what is essentially the same thing as the differential impact in timing and extent of impact of the changes in the world economy on product prices, resulted in the fluctuations in the commodity terms of trade.

Table 2 also shows that the price index for the principal traditional exports fluctuated more than the overall export price index during 1965-1982. (The traditional export price index was computed from the export price indices of sugar, coconut-by-products, copper, abaca, logs and lumber, and plywood.) Similarly, these traditional products commodity terms of trade fluctuated more than the aggregate commodity terms of trade.

Commodity Decomposition. A commodity decomposition of the terms of trade facing the traditional exports was done, using equation 2, in order to examine further the sources of instability. Each commodity export price index was divided

by the overall import price index to form the t_is in equation 2. The weights used are the average percentage share of each commodity export to the total export earnings of the group during 1970-1974. The decomposition analysis was based on the variances and covariances of the ratios of the actual to the estimated values of the logarithms of the variables.

Tables 3 and 4 present the results of the commodity decomposition. Table 3 gives the correlation matrix of the residuals from trend of the ratios of the commodity export price to the overall import price. Table 4 gives the decomposition of the variance of the principal exports commodity terms of trade by commodity group.

The matrix of correlation coefficients (Table 3) shows a surprising number of negative correlation between the price deviations. This is particularly in the case of sugar, coconut products, and forest products. Note that a value of 1 indicates that two series move exactly together, a value of -1 indicates movements exactly in opposite direction, and a value of 0, independence. (Table 3 indicates that the assumption that the prices are independent random variable can be rejected.) It appears therefore, that some prices moved in opposition. Because the Philippines is essentially a price taker in the world market

Table 3. Correlation Matrix of Residuals from Trend of the Commodity
Export Price to Overall Import Price Ratios.

	Abaca	Copra	Cocooil	Desicoco	Começa	Sugar	Copcon	Pwood	Logs	Lumber
Abaca	1.000									
Copra	.411	1.000								
Cocooil	.461	.975	1.000							
Desicoco	.105	.843	.827	1.000						
Copra meal/ cake	-.086	.455	.456	.377	1.000					
Sugar	.450	-.401	-.324	-.494	-.600	1.000				
CopCon	.482	.385	.349	.176	-.051	.041	1.000			
Plywood	.306	.302	.189	.459	.144	.636	.161	1.000		
Logs	-.005	.385	.364	.621	.544	.520	.041	.524	1.000	
Lumber	-.359	.196	.091	.296	.452	.771	-.014	.707	.594	1.000

Table 4. Decomposition of the Variance of the Commodity Terms of Trade (t) by Commodity Group.

COMMODITY	(1972) Value Weights	Variance Commodity Price Relative	Indepen- dent Terms	Abaca	Coco- nut Oil	Cop Con	Copra	Comeca	Desi- coco	Logs	Lumber	Plywood	Sugar	SUM
							Percentage Contribution of Commodity Group to Variance of t — Covariance Terms							
1. Abaca	.0162	.00166	.076	–	.268	.687	.242	-.004	.013	-.005	.018	.032	1.039	2.289
2. Cocooil	.0908	.00309	4.460	.268	–	3.920	4.392	.188	.719	2.573	.040	.153	-6.287	5.966
3. CopCon	.2202	.00284	24.108	.687	3.920	–	4.342	-.018	.420	-.648	.014	.347	.560	9.624
4. Copra	.0880	.00336	4.555	.242	4.392	4.342	–	.190	.738	2.720	.083	.250	-7.706	5.251
5. Copra Meal & Cake	.0160	.00077	.034	-.004	.188	-.018	.190	–	.029	.347	.016	.011	-.978	-0.219
6. Desicoco	.0202	.00237	.169	.013	.719	.420	.738	.029	–	.855	.023	.073	-1.758	1.112
7. Logs	.2102	.00158	12.221	-.006	2.573	-.648	2.720	.347	.855	–	.384	.696	-14.874	-7.953
8. Lumber	.0180	.00063	.036	.018	.040	.014	.083	.016	.023	.384	–	.052	-1.228	-.598
9. Plywood	.0300	.00096	.151	.032	.153	.347	.250	.011	.073	.696	.052	–	-2.077	-.463
10. Sugar	.2908	.00491	72.689	1.039	-6.287	.560	-7.706	-.978	-1.758	-14.874	-1.228	-2.077	–	-33.309
Total	1.000		118.499	2.289	5.966	9.624	5.251	-.219	1.112	-7.953	-.598	-.463	-33.309	-18.300

(except possibly for copra~and coconut oil), what this suggests is that the movements of the specific demand factors affecting each of the export products were not synchronized. This may also suggest, particularly in the case of copra and coconut oil vis-a-vis sugar or logs and lumber, that differences in supply factors were also operative in the sense that the pattern of supply responses of coconut by-products (which the Philippines is the most important exporter) differ from those of sugar or logs and lumber.

The results of the commodity decomposition of the terms of trade in Table 4 indicate that both the variation of the individual commodity prices and the interaction among the prices explain the variation of the commodity terms of trade. Table 4 shows that fluctuations in sugar prices accounted for around 40 percent of the variation in the commodity terms of trade while copper contributed another 34 percent. For sugar, it is the combined results of having the largest export share (during 1970-1974) and the most volatile export prices.[*] The high contribution of copper

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[*] It may be noted that the international price of sugar was more unstable than the export unit value index of Philippine sugar exports during 1965-1982. As measured by S_2, the variability of the former is .148 and that of the latter is .07, which is more than 50 percent lower. On the other hand, the trend annual growth rate of the international sugar price was 13.7 percent as compared to 6.3 percent for the Philippine sugar export unit value

resulted from the larger export share weight and the positive interactions with the other commodities. Logs, which has the third largest share, had a negligible contribution to the variation in the terms of trade, because of relatively stable prices around trend and a substantial negative correlation of price movements especially vis-a-vis sugar. Copra meal/cake, lumber, and plywood the three commodities with the least price variability did not contribute at all to the variation of the commodity terms of trade.

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It appears therefore that one of the effects of the government intervention in sugar trading during the seventies is the reduction in the instability of the sugar prices facing the producers at the expense of a lower trend growth rate.

COMMODITY DIVERSIFICATION

The implications for trade policy pertains essentially
to commodity diversification in order to reduce instability
in export earnings and commodity terms of trade. Among the
principal export products, commodity diversification
requires a movement away from sugar to the rest of the
commodities, a shift from copra to coconut oil, desiccated
coconut, and copra meal/cake and a shift from logs to lumber
and plywood. To some extent this shift has occurred
already. The trend annual growth rate during 1965-1982 of
the volume of copra exports was minus 4.6 percent as
compared to 11.2 percent for coconut oil. The trend annual
growth rate during the period of 2.1 percent for the volume
of sugar exports is lower than the growth rates for copper,
copra by-products, and plywood. Abaca and logs and lumber
were not viable sources of export expansion, partly because
of policy and supply constraints; the two commodities regis-
tered negative trend growth rates in the volume of exports,
along with copra during 1965-1982.

It can be argued however that the more realistic
direction of commodity diversification is not a realloca-
tion among the principal export commodities (because policy
and resource constraints or unfavorable world demand trends
make them less viable as sources of vigorous export growth)

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but rather a shift to other agricultural and resource-based export commodities and to manufactures. Because of heterogeneity of manufactured products and therefore the difficulty of constructing appropriate and comparable indices, it is not possible to explore the impact on the instability of export earnings and terms of trade (although presumably the instability would decrease). What can be explored to some extent is diversification to agricultural and resource based commodities which are not included among the principal traditional exports of the Philippines.

The aim of commodity diversification is to raise the trend growth rate of export earnings while at the same time reducing the instability of the earnings. This would presumably mean a mix of fast growing commodities with low instability, fast growing commodities with unstable prices, and other commodities with price movements opposite those of the unstable, fast growing commodities.

Table 5 presents the trend growth rates and variability of the international prices of a selected number of commodities that appear to be of interest to the Philippines. Of the 14 commodities selected, the Philippines is already an exporter of banana, coffee, nickel, shrimps, and tobacco. The Philippines is still in the import substitution stage for the rest of the commodities except for palm oil which is currently being developed in the country primarily

Table 5.   Trend and Instability of International Commodity
            Prices, Selected Commodities, 1965-1982.

COMMODITY	TREND RATE[a] (%)	INSTABILITY[b]
1. Banana	6.30	0.0315
2. Cacao	11.99	0.0763
3. Coffee	8.97	0.0851
4. Maize	5.02	0.0489
5. Nickel	9.22	0.0169
6. Palm Oil	3.63*	0.1373
7. Black Pepper	5.48	0.0522
8. Rice	6.36	0.0729
9. Rubber	7.15	0.0561
10. Shrimps	11.91	0.0271
11. Sisal	14.01	0.1182
12. Sorghum	7.34	0.0439
13. Soybeans	7.02	0.0491
14. Tobacco	5.66	0.0187
Average	7.67**	0.0596

[a] Calculated from an OLS estimate of $\ln X = a+b$ Time where
X is any variable. The values given above are equal to b multiplied
by 100.

[b] Measured by the ratio of the standard error of the regress-
ion to the logarithm of the mean value of the variable.

*Not statistically significant.

**This value assumes a zero growth rate for palm oil.

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for export. The average trend growth rate of the international prices of the major traditional exports (i.e., sugar, copra, coconut oil, copper, logs and lumber, plywood, and abaca) is nearly equal to the mean growth rate for the 14 commodities as well as the subset of actual and probable exports (i.e., banana, cacao, coffee, nickel, palm oil, rice, shrimps, and tobacco) in Table 5. Thus, export diversification in the medium run to the commodities listed in Table 5 would not appreciably improve the overall Philippine commodity export price trend. Furthermore, given the aggregate overall import price trend, the export diversification would not also appreciably improve the secular trend of the commodity terms of trade.

The mean measure of price instability of the traditional exports during 1965-1982 is 0.0661 as against 0.0596 for the 14 commodities in Table 5. This seems to suggest that export commodity diversification toward the 14 commodities would reduce overall export price instability. However, the overall export price instability also depends on the extent of concordance of the price movements of the

various commodities. The correlation matrix of the residuals from trend of the international commodity prices during 1965-1982 are given in Table 6. The table shows many instances of high positive correlation between the major traditional Philippine exports and the 14 commodities and among the 14 commodities themselves. Thus it is not certain that export diversification toward the 14 commodities would reduce the instability of the overall export price index.

A number of the commodities listed in Table 5 do not seem to offer prospects of vigorous growth in export volume and substantial share of Philippine exports in the medium run. For example, banana (now a major Philippine export) is probably topping out already. The short run prospect for nickel exports is hampered by the production problems of the Nonoc Island (Surigao) mine, in part induced by the oil price increases which sharply raised power costs. While it can be expected that there could be exportable rice surplus in the medium run, Philippine rice exportation is hampered by quality problems so much so that Philippine rice can only be sold in the world market at a great discount. Furthermore, the improving rice production prospects in the Asian region mean that the world demand for rice exports will secularly drop.

Table 6. Correlation Matrix of Residual from Loglinear Trends of International Prices.

	ABACA	BANANA	CACAO	COCOOIL	COFFEE	COPPER	COPRA	LOGS	MAIZE	NICKEL
Abaca	1.000									
Banana	0.051	1.000								
Cacao	0.103	0.176	1.000							
Cocooil	0.694	0.089	0.575	1.000						
Coffee	0.112	0.245	0.793	0.405	1.000					
Copper	0.627	0.163	0.244	0.665	0.107	1.000				
Copra	0.646	0.084	0.613	0.990	0.432	0.689	1.000			
Logs	0.509	0.534	0.297	0.678	0.300	0.775	0.643	1.000		
Maize	0.856	0.069	0.233	0.610	0.246	0.522	0.573	0.460	1.000	
Nickel	0.378	0.170	-0.069	0.018	0.295	0.208	-0.028	0.290	0.369	1.000
Palmoil	0.478	0.032	0.567	0.609	0.767	0.373	0.607	0.353	0.587	0.384
Pepper Black	0.471	0.107	0.679	0.543	0.763	0.131	0.533	0.164	0.530	0.269
Plywood	0.318	0.041	0.327	0.576	0.203	0.801	0.643	0.671	0.368	0.003
Rice	0.664	0.097	0.396	0.696	0.132	0.585	0.681	0.460	0.736	0.028
Rubber	0.456	0.597	0.555	0.665	0.504	0.746	0.710	0.840	0.476	0.121
Sisal	0.433	0.061	-0.255	0.162	-0.497	0.207	0.157	0.181	0.293	-0.278
Shrimp	-0.049	0.150	0.364	0.057	0.365	0.093	0.093	0.272	0.090	-0.052
Sorghum	0.865	0.089	0.130	0.609	0.134	0.628	0.582	0.562	0.959	0.382
Soybeans	0.630	-0.072	0.451	0.644	0.482	0.512	0.680	0.446	0.785	0.100
Sugar	0.750	0.326	0.011	0.329	0.130	0.355	0.283	0.115	0.741	0.526
Tobacco	-0.102	0.691	0.020	-0.022	-0.298	0.166	0.032	0.291	-0.152	-0.255

Table 6. Cont.

	PMOIL	PEPPER	PWOOD	RICE	RUBBER	SISAL	SHRIMP	SORGHUM	SOYBEANS	SUGAR	TOBACCO
Paloil	1.000										
Pepper, Black	0.675	1.000									
Pwood	0.374	0.062	1.000								
Rice	0.515	0.286	0.520	1.000							
Rubber	0.505	0.412	0.641	0.529	1.000						
Sisal	-0.478	-0.097	0.076	0.219	0.097	1.000					
Shrimp	0.009	0.269	0.152	-0.134	0.302	0.155	1.000				
Sorghum	0.520	0.374	0.514	0.813	0.514	0.348	0.028	1.000			
Soybeans	0.655	0.565	0.617	0.659	0.554	0.214	0.290	0.768	1.000		
Sugar	0.551	0.388	0.163	0.559	0.081	0.042	-0.148	0.749	0.530	1.000	
Tobacco	-0.429	-0.320	0.024	0.096	0.263	0.329	-0.051	-0.119	-0.335	-0.527	1.000

Note: This is the correlation matrix of the residuals from loglinear trend of international price indices during 1965-1932. Data on international price indices from IMF International Financial Statistics 1983 year. The loglinear trend is an OLS estimates.

On the whole, it appears therefore that an export commodity diversification toward the commodities listed in Table 5 would not have appreciably improved the growth trend of, and would not have appreciably reduced the instability of the country's export earnings and terms of trade during 1965-1982. Neither would the export diversification to the other agricultural products appreciably improve the growth trend and relative variability of the country's export earnings and terms of trade in the near future.

CONCLUSION

The analysis indicates that much of the instability of the export earnings and terms of trade during 1965-1982 was beyond Philippine control. Furthermore, an export commodity diversification to other agricultural and mineral commodities would not have appreciably improved the overall export and terms of trade picture during the period.

Nonetheless, the 1983 Philippine payments crisis cannot be squarely blamed on exogenously - influenced export and terms of trade instability. For as Table 7 below indicates, the Philippines had lower instability of export earnings

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Table 7. Export Earnings and Commodity Terms of Trade
Instability: Selected Countries (1965-1982).

	EXPORT EARNINGS	COMMODITY TERMS OF TRADE
Philippines	0.0370	0.0314
Indonesia	0.0719	0.0282
Malaysia	0.0452	0.0249
Thailand	0.0441	0.0293
South Korea	0.0474	0.0432

Note: The measure of instability is the ratio of the standard
error of the regression to the logarithm of the mean value
of the variable.

than Indonesia, Malaysia, Thailand, and South Korea during

1965-1982. Furthermore, the terms of trade instability in

the Philippines was lower than that of South Korea, although

it was higher than those of Indonesia, Malaysia, and

Thailand. Since the other countries did not experience

payments crises, export and terms of trade instability can

not be the determining factor for the current Philippine

economic crisis.

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