PRIMARY COMMODITY EXPORT REVENUE VARIABILITY IN THE SOUTH PACIFIC ISLAND NATIONS: A VARIANCE DECOMPOSITION APPLICATION

Sospeter N. Onchoke and Euan M. Fleming

Department of Agricultural and Resource Economics
University of New England
Armidale NSW 2351

Contributed paper presented to the Australian Agricultural Economic Society 38th Annual Conference, Victoria University, Wellington, New Zealand, 8-10 February, 1994

PRIMARY COMMODITY EXPORT REVENUE VARIABILITY IN THE SOUTH PACIFIC ISLAND NATIONS: A VARIANCE DECOMPOSITION APPLICATION[1]

By

Sospeter N. Onchoke and Euan M. Fleming[2]

Department of Agricultural and Resource Economics

The University of New England, Armidale, NSW, Australia

ABSTRACT

This paper examines the contributions of individual major primary sectors and commodities to aggregate commodity export revenue variability (CERV) of selected South Pacific island nations (SPINs). Further, the causes of CERV are investigated on the basis of demand, supply and demand-supply interaction factors. This work is accomplished via a variance decomposition model (VDM) approach. The investigations are undertaken for different time periods, ranging from 30- to 5-year sub-periods. The preliminary results show that the variance contributions are variable across the selected SPINs, time periods, sectors and commodities. These results could be used as evidence in guiding the policy decision-making process as to whether or not to operate commodity-specific price stabilisation schemes to stabilise CERV in the selected SPINs.

1. INTRODUCTION

This paper is concerned mainly with the decomposition of CERV for selected SPINs into various components. These components are demand, supply, demand-supply interactions and pairs of individual commodity interaction effects on variability. To accomplish this, a VDM approach (Piggott 1978, 1981) is applied.

---

1 Contributed paper presented to the Australian Agricultural Economic Society 38th Annual Conference, Victoria University, Wellington, New Zealand, 8-10 February, 1994.

2 The authors are graduate student and senior lecturer, respectively, in the Department of Agricultural and Resource Economics, University of New England, Armidale, NSW 2351, Australia.

The findings of this analysis are used to address the highly formalised commodity-specific price stabilisation schemes which have been in operation in the SPINs for almost over 40 years now. The schemes started in Papua New Guinea (PNG) with a copra stabilisation scheme put in place in 1947. Later on, more commodities within PNG and other SPINs were covered. The schemes are costly to operate and were formed based on little empirical evidence as to the sources of CERV.

As in many other less developed countries (LDCs), CERV is important in the SPINs because these nations are heavily dependent on exports of primary commodities accounting for up to 80% of their total earnings (Adams and Behrman 1982). It is commonly believed that CERV has deleterious effects on the economies of these countries. Fleming and Piggott (1989) indicated that there have been substantial fluctuations in agricultural export earnings (both in aggregate and on an individual commodity basis) in all SPINs for the past two decades or so. Most of the variability could be attributed to price fluctuations but also substantially to export volume fluctuations, with the extent of export variability varying among commodities and countries.

Taking three selected SPINs - Fiji, PNG and Solomon Islands (SI) - major export commodities from each nation are selected and examined for the sources and nature of CERV. As a result, possible alternative strategies for reducing or eliminating the problem are outlined. Some of the recent socioeconomic indicators (ANU 1992) in these selected SPINs reveal the following information:

* Fiji has land area of about 18 272 sq km, 725 000 human population and 1990 per capita GNP of US$1770. Agriculture, mining and manufacturing are the major components of the national income by sector. The principal export commodities are sugar and molasses, fish, gold, copra, lumber and coconut oil. By the SPINs standards, Fiji represents a medium and fairly diverse economy.

Table 1 shows the dominant export commodities for Fiji during the past 3 decades. Sugar was by far the single most important export commodity throughout the decades. This was followed by coconut oil and gold. The importance coconut oil started to decline in the 1970s and that of sugar in the 1980s when gold and fisheries started to develop as important export commodities. Tourism and textiles, which are other major export commodities for Fiji, were not covered in this study because of the technical unavailability of their data. Thus, about 70% of the total export sector for Fiji is covered in this study.

* PNG has a total land area of about 462 840 sq km, 3 528 000 human population and 1990 per capita GNP of US$860. Its national income is derived mainly from agriculture, mining, manufacturing, fishing and forestry. PNG's principal export commodities are gold, copper, coffee, cocoa, logs, palm oil, coconut, copra and marine products. Coffee, cocoa, coconut products and palm oil together accounted for some 40% of the total domestic export earnings (or 30% of total exports) and 90% of all agricultural exports between 1980 and 1985 (Kiele 1987). By South Pacific standards, PNG is selected to represent a large and diverse economy.

  Table 2 indicates that agricultural commodities (coffee, cocoa, copra and coconut oil) were the major export commodities for PNG during the 1960s and 1970s. Copra was the most important export commodity in the early 1960s, but towards the late 1960s and the whole of 1970s, copra was overtaken by coffee and cocoa, respectively. The importance of agricultural commodities started dwindling from the 1970s when the mineral commodities (copper and gold) started to grow in importance in the export sector. The minerals maintained their lead throughout the 1980s. Agricultural commodities were still important even in the 1980s. In general, at least 85% of the total exports are covered in this study.

* Solomon Islands has a land area of about 28 900 sq km, 324 000 human population and 1990 per capita GNP of US$580. The major components of the national income are agriculture, fishing, forestry and manufacturing. Principal export commodities include timber, fish

products, palm oil and kernel, cocoa and copra. Solomon Islands represents a small and fairly concentrated economy.

Table 3 shows the most important export commodities for SI during the past 30 years. Throughout the first two decades, copra was by far the most important export commodity for SI. It started to diminish in relative importance during the late 1970s through to the 1980s when forestry and fishery (marine) industries developed to become the most dominant in the export sector. Starting from the late 1970s, palm oil also grew in importance. Overall, almost 95% of the total exports for SI are covered in this study.

The remaining part of this paper is organised as follows. Section 2 covers some general views about CERV. Method is covered in section 3. Results and discussion (including data) are presented in section 4 while some policy implications and conclusions are drawn in section 5.

2. CERV - SOME GENERAL VIEWS

CERV is prevalent in all countries - both developed countries (DCs) and LDCs - whose trade is based mainly on primary commodities for export. It is a situation where revenues from export commodities vary substantially over time. Variability can be intertemporal, i.e. short-term (from season to season) or long-term (over several years). Short-term fluctuations are regarded as the variance of export revenues. Variability can also be spatial, i.e. fluctuating from one area to another within a country or region. For this research the problems of CERV are investigated as they relate to both intertemporal and spatial behaviour. However, emphasis is focused on intertemporal rather than spatial variability in this study.

During the past three decades or so, perceived deleterious effects of CERV on the small open developing economies in the SPINs have resulted in stabilisation programs becoming major policy concerns in the export sector (Fleming and Piggott 1989, Piggott, Fleming and Kunert 1986). One of the perceived problems of this

research is that the governments of these nations have, with no or little formal empirical evidence, generally accepted that CERV has adversely affected both the macro- and micro-economic variables of their nations. Macro-economic variability, in particular that is induced through export trade variability, has become a major policy concern in many LDCs because of the beliefs (again without much evidence) that fluctuations in any economy are undesirable.

For instance, PNG's economy is heavily reliant on exports of primary products (which contribute about 40% of the country's total GNP) whose prices are at the mercy of the inherently fluctuating forces of international trade. This has made the economy susceptible to export price volatility which in turn has affected incomes and, consequently, perhaps the welfare of residents. Export price instability could conceivably cause serious poverty problems for the smallholder farmers who are heavily dependent on export earnings to maintain their living standards. Fluctuations in commodity prices might have a significant impact on aggregate export earnings whereby a fall in commodity prices might lead to a call for devaluation measures, it is claimed, unless adequate foreign exchange reserves are available (which is normally not the case). Devaluation may in turn lead to inflationary trends and then wage increases through indexation (Kiele 1987, Beck and Dalton 1987, Fleming and Piggott 1989).

The central issue of this research, therefore, is that CERV is strongly claimed to be externally-induced and has adverse effects on the economies of the SPINs, but evidence on its sources and the nature and extent of its effects is lacking. Besides, few people are sure whether the actual causes of CERV have been identified. Despite the foregoing, the claims that CERV is externally-induced and has adverse effects on the economies have prompted the authorities in SPINs to formulate and operate remedial policies such as the commodity-specific price stabilisation schemes. However, it is now becoming increasingly questionable whether these schemes are the appropriate approaches used to deal effectively with the perceived deleterious problem of CERV.

Consequently, the main aim of this study therefore is to establish the sources of CERV in terms of demand, supply, demand-supply and individual sector/commodity variability components. The results from this research may be useful in assessing the effectiveness of commodity-specific price and other general stabilisation policies in reducing CERV in the SPINs.

3. METHOD

Several methods have been developed and applied for estimating the sources of variability in economic variables (Offutt and Blandford 1983). Some of the earliest methods (Burt and Finley 1968, Borhrstedt and Goldberger 1968) used formulae for decomposing the variance of random identities. Methods of decomposing economic variables into various variance and covariance components have been applied in the past. For example, the gross revenues of Australian beef, wheat and wool industries have had their variances decomposed into variance and covariance components due to prices and outputs by Houck (1973) while Hazell (1984) decomposed the variances of Indian and US cereal output into variances and covariances due to area and yield components. Although useful in many ways, these variance decomposition methods of random identities did not delineate the variability of the main market variables into demand and supply effects.

The VDM approach suggested and developed by Piggott (1978, 1981) overcomes this limitation and is adapted in this research. Piggott showed how to decompose the gross variance of revenue variability into supply and demand effects based on structural simultaneous equations model. Since then, VDM has been applied in several cases (see, for example, Myers and Runge 1985, Fleming and Piggott 1985, 1989, Piggott et al. 1986).

Decomposition of the key export market variables (price, volume and revenue) into components due to demand, supply and demand-supply interaction variability for

each commodity forms the basic element in VDM. These components are estimated for aggregate exports, individual sectors and commodities (see Figure 1).

The variance of total export revenue can be decomposed into variances and covariances of individual sector and commodity revenues. That is:

$$\text{var}(TR) = \sum_{i=1}^{n} \text{var}(R_i) + 2 \sum_{i=1}^{n} \sum_{j=i+1}^{n-1} \text{cov}(R_i, R_j) \qquad (1)$$

where:

TR = aggregate export revenues

R_i = export revenues from sector/commodity i (i = 1, ..., n)

var = variance operator

cov = covariance operator.

To disaggregate CERV (measured in terms of variance) in TR, it is necessary, in this procedure, to consider all individual variances and covariances of selected sectors and/or commodities. The relative contributions of the variances and covariances of individual sector/commodity revenues are then determined as percentages of the aggregate CERV. These proportions are regarded as the basic sources of aggregate CERV in terms of sector and commodity contributions (Fleming and Piggott 1985, 1989).

This procedure of the VDM approach forms the basis of analysis in sub-sections 4.2 and 4.3 of this paper. CERV is decomposed into relative contribution of individual and pairs of individual sector/commodity components. To illustrate this procedure of VDM, it is assumed that TR from equation (1) is composed of export revenues from n sectors/commodities (R_1, ..., R_n) such that:

$$TR = R_1 + ... + R_n \quad (2)$$

The variance decomposition of TR proceeds as follows:

$$\text{var}(TR) = \text{var}(R_1) + ... + \text{var}(Rn) + ... + 2\,\text{cov}(R_1, Rn) \quad (3)$$

In order to decompose the key market variables into variance components due to demand and supply effects, the commodity export markets are assumed to be represented by linear demand and supply models whose slopes are also assumed to be constant over time. These linear demand and supply functions are represented as follows:

$$Q_t^d = a_t + bP_t \quad \text{(demand)} \quad (4)$$

$$Q_t^s = c_t + dP_t \quad \text{(supply)} \quad \text{and} \quad (5)$$

$$Q_t^d = Q_t^s \quad \text{(equilibrium)} \quad (6)$$

Note that a_t and c_t are referred to as net intercepts because they embody effects of several exogenous demand and supply shifters, e.g., income and technology, respectively.

After computations in terms of net intercepts, the above models result in the following equilibrium price (P_t^*), quantity (Q_t^*) and revenue (R_t^*) expressions:

$$P_t^* = \pi_1 (a_t - c_t)$$
$$= (a_t - c_t)/(d-b) \quad (7)$$

$$Q_t^* = \pi_2 a_t - \pi_3 c_t$$

$$= (a_t * d - c_t * b) / (d-b) \tag{8}$$

$$R_t^* = P_t^* Q_t^*$$

$$= \pi_1\pi_2 a_t^2 + \pi_1\pi_3 c_t^2 - (\pi_1\pi_2 + \pi_1\pi_3) a_t c_t$$

$$= \pi_1 a_t^2 + \pi_2 c_t^2 - (\pi_1 + \pi_2) a_t c_t \tag{9}$$

where:

$$\pi_1 = 1/(d-b) \tag{10a}$$

$$\pi_2 = d/(d-b) \tag{10b}$$

$$\pi_3 = b/(d-b) \tag{10c}$$

To measure variability in terms of variance, price, quantity and revenue expressions can be derived as functions of variances and covariances of the demand and supply intercepts. Applying the variance operator of the equilibrium P_t^*, Q_t^* and R_t^* results in the following expressions:

$$var(P_t^*) = \pi_1^2 var(a_t) + \pi_1^2 var(c_t) - 2\pi_1^2 cov(a_t, c_t)$$

$$= (d-b)^2 \, [var(a_t) + var(c_t) - 2\, cov(a_t, c_t)] \tag{11}$$

The direct contribution of demand shifts to price variance is $(d\text{-}b)^2\, var(a_t)$, that of supply shifts is $(d\text{-}b)^2\, var(c_t)$ and $(d\text{-}b)^2\, cov(a_t, c_t)$ is an interaction effect (Myers and Runge 1985). That is:

$$var(Q_t^*) = \pi_2^2 var(a_t) + \pi_3^2 var(c_t) - 2\pi_2\pi_3 cov(a_t, c_t)$$

$$= \pi_2^2 var(a_t) + \pi_3^2 var(c_t)$$

$$- 2\pi_2\pi_3 cov(a_t, c_t) \qquad (12)$$

and

$$var(R_t^*) = \pi_4^2 var(a_t^2) + \pi_5^2 var(c_t^2)$$
$$+ (\pi_4 + \pi_5)^2 var(a_t c_t) + 2\pi_4\pi_5 cov(a_t 2, c_t^2)$$
$$- 2\pi_4(\pi_4 + \pi_5) cov(a_t^2, a_t c_t)$$
$$- 2\pi_5(\pi_4 + \pi_5) cov(c_t, a_t c_t)$$

$$= \pi_1^2 var(a_t^2) + \pi_2^2 var(c_t^2)$$
$$+ (\pi_1 + \pi_2)^2 var(a_t c_t)$$
$$+ 2\pi_1\pi_2 cov(a_t 2, c_t^2)$$
$$- 2\pi_1(\pi_1 + \pi_2) cov(a_t^2, a_t c_t)$$
$$- 2\pi_2(\pi_1 + \pi_2) cov(c_t^2, a_t c_t) \qquad (13)$$

where, from equation (9),

$$\pi_4 = \pi_1\pi_2 \qquad (14a)$$

$$\pi_5 = \pi_1\pi_3. \qquad (14b)$$

Thus, the variance (R^*) is attributable to a demand effect (DE), a supply effect (SE) and an interaction effect between demand and supply (IE). This is defined as:

$$var(R^*) = DE + SE + IE \qquad (15)$$

where:

DE = direct demand effect which is = $D_1 + D_2 + D_3$

$$
\begin{aligned}
DE \quad &= var(a)[4E^2(a)\pi_4^2 + (\pi_4 + \pi_5)^2(c) \\
&- 4\pi_4(\pi_4 + \pi_5)E(a)E(c)] - var^2(a)\pi_4^2 \\
&+ E(a)^3[4E(a)\pi_4^2 - 2E(c)\pi_4(\pi_4 + \pi_5)] \\
&+ E(a)^4\pi_4^2 \qquad (16)
\end{aligned}
$$

where the first 4 terms, the 5th and 6th and the last right hand term of (16) are equal to D_1, D_2 and D_3, respectively, and SE = direct supply effect which is = $S_1 + S_2 + S_3$ and is analogously defined as in equation (16).

The interaction term, IE in (15) is defined as:

$$IE = var(R^*) - DE - SE. \qquad (17)$$

Piggott's (1978) method has limitations too. While the interaction terms and the are difficult to interpret, a large interaction term reflects correlation between a_t and c_t. This suggests that both supply and demand effects are important causes of variability. The assumption of partial equilibrium with linear and static supply and demand models is restrictive. Further, VDM requires the use of a structural econometric model. However, this requirement could be waived if prior estimates of elasticities of supply (e^s) and demand (e^d) at price and quantity data means are available (Myers and Runge 1985, Myers, Piggott and Tomek 1990). Based on equations (4) and (5), the formula for elasticity is:

$$b = e^d(\overline{q} / \overline{p}) \qquad (18)$$

$$a_t = q_t - bp_t \qquad (19)$$

$$d = e^s(\overline{q} / \overline{p}) \qquad (20)$$

$$c_t = q_t - dp_t \qquad (21)$$

where:

$\overline{q}$ = mean quantity over study period

$\overline{p}$ = mean price over study period.

Thus, all the information needed to complete the VDM application could be computed from quantity and price data and the elasticities of demand and supply at the data means. To validate the usage of the estimated elasticities, sensitivity analysis is employed with different elasticities and different time-periods.

The time periods are intended to reflect the importance of major structural changes in both external and domestic markets. Hence, the importance of categorising the data into sub-periods to match the changes which might subsequently lead to changes in government interventions (such as the stabilization policies). The 30-year period represents general changes within the past three decades; the 15-year sub-period represents proxy changes before and after independence; while 10-year sub-periods represent changes within the decades. The 5-year sub-periods represent shorter term changes as reflected in periods used in development plans.

4.0 RESULTS AND DISCUSSION

4.1 Data and Data Sources

Data used used in this study are annual free-on-board (fob) aggregate export values, fob commodity export values and export quantities covering a period of 30 years, approximately from 1961 to 1990. Data on fob export prices for all commodities were computed by dividing the annual fob export values by the respective export quantities. All data were utilised at their current levels and their magnitudes were based on equal denominations, on the basis of thousands.

Since the objective of this study was to find the sources of CERV in the selected SPINs, it was necessary to cover the most important primary export commodities of the selected nations. Several commodities were identified, selected

and their data gathered for the selected SPINs. Six commodities (sugar, molasses, coconut oil, gold, forestry and marine) were chosen for Fiji. Data for sugar, molasses, coconut oil and gold were available for 30 years (1961-90) while those for forestry were available for 28 years (1963-90) and those for marine exports for 16 years (1975-90). PNG data covered twelve commodities (coffee, cocoa, copra, coconut/copra oil, rubber, tea, palm oil, logs, forestry, marine, copper and gold). Coffee, cocoa, copra, copra oil, rubber, logs, forestry and marine data were available for 30 years (1961-90). Tea data were available for 28 years (1963-90) while data for palm oil and copper were available for 20 years (1971-90) and those for gold were available for 15 years (1976-90). SI data covered seven commodities (copra, forestry, cocoa, marine, fish, gold, palm oil and kernel). Copra, marine and gold export data were available for 30 years (1961-90) while fish export data were available for 20 years (1971-90) and palm oil for 15 years (1976-90).

The sources of these data were many. They included the International Financial Statistics Yearbooks (IFS) (International Monetery Fund (IMF) 1990-92) and various government and private reports for aggregate export values and various commodities, respectively. These reports included the South Pacific Economic and Social Database (National Centre for Development Studies (NCDS) 1991), current economic statistics (Fiji Government 1982 1991), Pacific Islands Yearbooks (Tudor 1963 1968 1972, Inder 1977 1978, Carter 1981), colonial government reports (Anon. 1962-70), Australian Government reports (Australian Government 1969 1971 1972 1973), Bank of Papua New Guinea (1991), Australian International Development Assistance Bureau (AIDAB) (1991a 1991b), Lam (1984), Government of PNG (various issues), British SI Protectorate (1971), SI Government (1962-75), SI Government (1979-84) and Central Bank of SI (1992) reports.

4.2 Variance Contribution to CERV by Individual Sectors

(a) Fiji

The variability contribution of major sectors to CERV was quite substantial with agriculture being the most dominant contributor throughout the 30-year period and within all the prescribed sub-periods (Table 4). This variat ''ty was greatest in 1960s, decreasing towards 1970s and least towards the late 1980s when other new sectors such as mining and marine had emerged. In 1960s and 1970s the direct agricultural variability was over 85% of the total CERV, getting down to about 55% in the late 1980s. In most of the sub-periods, the pairwise sectoral interaction variability was positive, reinforcing the overall CERV.

(b) PNG

The variability from agricultural sector whose contribution to CERV was at least 90% was the most dominant in the 1960s. This changed in the 1970s and 1980s when variability from the mining sector became the most prominent, contributing about 80% of the total CERV (Table 5). Although the covariances from some sectors were negative mainly in the 1980s, most of these covariances were positive thereby reinforcing the CERV. In almost all cases, the direct variability from the individual sectors contributed over 70% variability to CERV.

(c) SI

At the sectoral level, variability contribution of individual sectors to CERV in SI was quite different from Fiji and PNG. Forestry was the most dominant in 1960s contributing about 50% of total variability. This changed in the 1970s when agriculture and marine each contributed about 28% of total CERV. In the 1980s individual contributions from marine were about 38% while those from the

agriculture and forestry sectors were about 15% and 13%, respectively (Table 6). In the remaining sub-periods, marine, forestry and agriculture contributed quite substantially to CERV. The total covariances, in almost all the sub-periods, were positive and more substantial than in Fiji and PNG. This reflects how paired sectoral interactions strongly reinforced the overall CERV.

4.3 Variance Contribution to CERV by Individual Commodities

(a) Fiji

Throughout the 30-year period and within all the selected sub-periods (Table 7), sugar was by far the single most important contributor of variability to the overall CERV. The direct variability contribution to CERV was predominant throughout the sub-periods, though this was more significant during the 1960s and 1970s when about 80% of the total CERV came directly from the individual commodities. Most of this variability was contributed by sugar though there were other commodities such as molasses, coconut oil, gold, forestry and marine whose variability contributions were minor. During the late 1960s, coconut oil became the second most important contributor of variability to CERV. Towards 1980s both gold and coconut oil were important, though still far from sugar, in contributing variability to overall CERV.

The direct contribution of variability to CERV for the whole 30-year period was almost similar to that of the last 5-year sub-period (1986-90)[3]. The total direct contributions for both of these two periods was at least 60% with sugar contributing about 50% of this while the interactive contribution was about 40% in both cases with sugar - gold interactions contributing 15% of this (Table 7).

---

3 Although the five-year sub-periods are discussed, their tabular results are not reported but can be made available on request.

(b) PNG

On disaggregating CERV to variability due to individual commodities, PNG was widely covered compared with either Fiji or SI. Data for 12 individual commodities became available, hence the wide coverage. This gave rise to 66 paired commodity interactions[4]. This made individual commodity contributions look relatively small. Thus, in the 1960s, coffee was the predominant contributor of direct variability to CERV, followed by cocoa and copra, (Table 8). In 1961-65, copra was second to coffee but in 1966-70 cocoa took over to become second to coffee in directly contributing variability to CERV during the 1960 decade. During the 1970 and 1980 decades the contributions from coffee diminished when the newly emerging commodities, copper and gold - from the mining sector, took the lead in contributing variability to overall CERV. Copper became the most important variability contributor in early 1970s and late 1980s, followed by gold which took the lead in the late 1970s and early 1980s (Table 8). The total direct variability contributions were about 45% in the 1960s, increasing to about 60% in the 1970s and 1980s.

The covariances were quite significant in PNG in that their total contributions were about 55% in the 1960s and 40% in the 1970s and 1980s. Most of these coveriances were positive thus reinforcing the direct variance contributions. However, towards the late 1980s (1986-90), the total interactive variability contribution was negative (about -18%). This worked towards offsetting direct variance contributions during the same period. In most of the sub-periods, the greatest covariabilities came from commodity pairs involving coffee, cocoa, copra, palm oil, copper and gold combinations of various sorts.

---

4 The 66 paired commodity interactions are not tabulated and reported herein because of their lengthy tables, but results are available on request.

(c) SI

The variability contribution to overall CERV by individual commodities in SI was largely distributed amongst copra, forestry, marine and fish. Forestry contributed the highest variability (at least 75%) during the 1960 decade, followed by copra with about 15% (Table 9). Shorter five-year sub-periods revealed that the distribution of this forestry and copra variability was such that copra accounted for over 95% of the total CERV in 1961-65 while forestry accounted for slightly more than 75% of the total CERV in the 1966-70 sub-periods during the 1960 decade.

During the 1970 and 1980 decades, marine and fish became the two leading variability contributors of almost equal magnitudes. These were followed by forestry and copra. Total direct variability contribution was over 90% during the 1960s and this decreased drastically to almost 40% and 50% during the 1970s and 1980s, respectively. This implies the importance of commodity interactions in the 1970 and 1980 decades when the contributions were about 60% and 50%. Although there were some interacting commodities with negative contributions during the early 1960s and late 1980s, these were not substantial enough to make the total interactive contributions negative. In all, total interactive contributions were positive, thus reinforcing the direct variability contributions. The largest interactions came from various paired combinations of forestry, copra, marine and fish.

4.4 Sources of Variability for the Major Export Market Variables

(a) Best guess elasticity estimates

The 'best guess' elasticity estimates are used in this study with an intention to overcoming some limitations in previous studies where demand and supply were assumed to be perfectly elastic and inelastic, respectively. These estimates, presented in Table 10 (Fleming and Piggott 1989), are utilised across the countries with similar commodities. The main consideration taken into account when estimating the

elasticities is the availability of substitutes for the SPINs' commodities. Not only is substitutability of one commodity for another within the SPINs is taken into account but more importantly the substitutability of the competitor countries' exports of commodities against those from the SPINs are of vital consideration. The more the substitutes within and outside the SPINs, the greater is the price elasticity of demand. Likewise, the ease with which a commodity is substituted at the production and/or supply level, the greater is the price elasticity of supply (Fleming and Piggott 1989).

(b) Fiji, 30-, 15- and 10-year sub-periods

Table 11 contains the sources of variability for the major market variables (price, quantity and revenue) due to demand, supply and demand-supply interaction variability for 30-, 15- and 10-year sub-periods. Supply variability was the major cause of variability in both price and quantity for sugar and molasses throughout the sub-periods. This is contrary to what Fleming and Piggott (1989) found during the 1970-83 sub-period. Demand fluctuations were responsible for price variability and supply for quantity throughout the sub-periods for the remaining commodities (cocoa, gold, forestry and marine). In all cases, demand-supply interaction effects played a significant role in contributing to both price and quantity variability.

The major sources of revenue variability varied across the commodities and sub-periods. For example, in sugar and molassses revenues, demand-supply interaction contributed more than either demand or supply alone toward revenue variability in most of the sub-periods. Of the direct effects, supply variability contributed more during the earlier sub-periods and demand variability more in the later sub-periods. Demand variability dominated supply variability for the whole 30-year period. Similarly, cocoa revenue variability was dominated by demand-supply interactions during the whole period, and the 1961-75 and 1971-80 sub-periods, followed by supply variability. During other sub-periods, supply variability was the

dominant contributor to variability in cocoa revenues. For gold and forestry export variability, demand dominated during the whole period, but demand-supply interactions dominated for marine export variability. Further, during the 1961-75 sub-period demand factors were dominant for gold and forestry while supply factors dominated for marine. In 1976-90, supply took over in gold, demand continued to dominate in forestry while demand-supply contributions dominated in marine. In the 1970s, supply effects were greatest in forestry and marine variability and demand in gold, while in the 1980s supply was more important in gold and demand in forestry and marine revenue variability.

In general, the evidence indicates that demand, supply and demand-supply interactions were all important in the determination of variability in commodity export revenues in Fiji. However, the importance of each factor kept shifting across variables and sub-periods. The five-year sub-periods confirm these findings, where supply and demand-supply effects maintained pre-eminence as major sources of variability even during the 1981-85 and 1986-90 five-year sub-periods.

(c) PNG, 30-, 15- and 10-year sub-periods

The sources of variability in the major exports in PNG during the 30-, 15- and 10-year sub-periods are presented in Table 12. During the 30-year period, demand effects were the main sources of variability in price while supply effects contributed most variability in quantity for all the primary commodities in PNG. Supply was the major cause of variability in coffee, marine, tea and palm oil revenues, followed by either demand or demand-supply interaction effects. Demand contributed most to cocoa and coconut oil revenue variability while demand-supply interaction effects caused most variability in copra, rubber, logs, forestry, copper and gold revenues - followed by demand effects. During the first 15 years (1961-75), the sources of variability changed quite a bit, especially for the revenue variable. Demand remained

the dominant source of variability in price (except for coffee prices which were dominated mostly by supply) while supply dominated quantity across most commodities. Demand-supply became the dominant cause of variability in coffee, copra and copper revenues; demand dominated in coconut oil, rubber and palm oil while supply did so in logs, forestry, marine and tea. In the second 15 years (1976-90), demand remained dominant in price and supply in quantity across all commodities. There were also a few changes in revenue variability in that demand-supply interaction effects remained the dominant sources of variability in coffee, cocoa, forestry and marine. Demand dominated in copra, coconut oil, rubber, logs, tea, copper and gold while supply dominated in palm oil revenues only, reflecting the more recent export situation particularly after independence.

In terms of 10-year sub-periods, demand was the dominant source of price variability of most commodities (except in coffee and copra where demand-supply dominated) while supply dominated the quantity of all the commodities. Revenues of coffee, cocoa, copra, rubber, logs, forestry, marine and tea were disturbed most by supply while demand dominated coconut oil revenues only. All these fluctuations occurred during the first 10-year sub-period (1961-70). During the 1971-80 10-year sub-period, demand was to price as supply was to quantity variability in all the commodities. Except for tea, palm oil and copper revenues whose variability was caused most by supply, demand effects were the major causes of variability in all the remaining commodities (coffee, cocoa, copra, coconut oil, rubber, logs, forestry, marine and gold). The results for coffee, cocoa, copra and coconut oil confirm those of Fleming and Piggott (1989) during the 1971-80 decade. In the latest decade (1981-90), the results for price and quantity remained pretty well the same as in the 1971-80 decade when demand dominated in price and supply in quantity for all commodities. However, variability in revenues changed quite significantly. Demand-supply interaction became the most dominant source of variability in coffee, cocoa, copra and marine revenues. Demand dominated in coconut oil, logs, forestry, tea, palm oil

and copper while supply dominated in rubber and gold revenues only. Hence, the sources variability differed across the commodities and sub-periods.

The results of the five-year sub-periods closely follow the above results. Supply and demand-supply factors were more important during the establishment and development stages while demand and demand-supply effects became more important during the 1980s, reflecting the most recent trends in export commodity variability.

(c) SI, 30-, 15- and 10-year sub-periods

Sources of variability in the main market variables for SI during the 30-, 15- and 10-year sub-periods are presented in Table 13. Over the whole period, demand was the major contributor of variability in price for all commodities except in forestry price where supply dominated, while supply was the main source of quantity variability. Demand dominated in revenues for copra, gold and fish; supply in cocoa only; and demand-supply interaction effects in forestry, marine and palm oil.

During the initial 15-year sub-period (1961-75), the picture for price and quantity variability was mainly similar to that of the 1961-90 period. However, demand-supply interactions were dominant in variability of copra and forestry revenues, demand in fish only, and supply in cocoa, marine and gold revenues, reflecting the initial establishment and development problems for these commodities. In the later 15-year sub-period (1976-90), demand was the major source of price variability for all commodities except in forestry prices where supply was dominant while supply dominated quantity in all the commodities. Demand dominated in most commodity revenues (copra, marine, gold, fish and palm oil) while supply dominated in cocoa and demand-supply in forestry only.

In the 10-year sub-periods, demand was the most important in prices, except forestry prices where supply was the most important, while supply was the most dominant for all commodity quantities. In commodity revenues, demand-supply

dominated in copra and forestry while supply dominated in cocoa, marine and gold during the 1961-70 decade. During the 1971-80 decade, prices were dominated by demand effects while quantities by supply effects in all commodities. Demand dominated copra and forestry revenue variability, supply dominated cocoa, marine, gold and fish revenue variability and demand-supply interaction effects dominated only palm oil revenues. These results are fairly close to those found by Fleming and Piggott (1989) for copra prices, quantities and revenues and palm oil prices and quantities during the 1970s. The sources of price and quantity variability for all the commodities during the latest 10-year sub-period (1981-90) were quite similar to those of the 1970s, but only the forestry prices were dominated by supply effects. Copra, marine, fish and palm oil revenue variability were dominated by demand effects while cocoa and gold was dominated by supply and forestry by demand-supply interaction effects. Like in other selected SPINs, SI experienced shifting sources of variability in the major market variables, particularly in the revenues. Revenue variability changed across the commodities and sub-periods.

During the five-year sub-periods, supply effects were the most dominant sources of variability in 1960s and 1970s - reflecting the establishment and development probems of the primary commodities. This dominance extended into the 1980s, although not as much as in the 1960s and 1970s. This was followed by the demand-supply effects and lastly by the demand effects.

5.0 SOME POLICY IMPLICATIONS AND CONCLUSIONS

The results of this analysis have produced some evidence indicating that the sources of variability in aggregate, sectoral and individual commodity export revenues are not singular. The relative variance contributions varied across the nations, sectors/commodities and time-periods. While direct contributions from

individual sectors/commodities were more important most of the time, indirect contributions from sectoral/commodity interactions were quite substantial.

When the analyses were based on demand, supply, demand-supply and commodity interaction effects as major causes of CERV during the longer sub-periods, it was found that the magnitudes of these effects also differed across nations, commodities and time-periods. For example, during the initial establishment and growth periods (1960s and early 1970s), supply effects were generally found to be the main sources of variability in most commodities. This feature was most characteristic in Fiji and SI. In PNG, the importance of each source depended a lot on the type of commodity. For example, supply was most important in coffee, cocoa, and copper while demand was more important for gold during the earlier decades. Demand and demand-supply interaction effects became more important during the later periods.

More specifically, the sources of variability in price, quantity and revenue during the longer sub-periods (30, 15 and 10 years) were fairly consistent. Demand was the source of most variability in prices while supply did so in quantities. In revenues, the relative importance of these sources varied from one commodity to another, country to country and from one sub-period to another. However, it can be concluded that supply and demand-supply interaction effects were more important in Fiji and SI than they were in PNG. Demand and demand-supply effects were more important in PNG. These patterns were observable even during the shorter five-year sub-periods.

What does this reflect in terms of policy implications? Since these results were very variable across the board (i.e, across countries, commodities and time-periods), it makes the formulation of stabilisation policy a very complex issue. This means that no one policy instrument can be used single-handedly in trying to stabilise CERV effectively. There is a need for multiple p v measures and very experienced and competent policy managers if the problem of .RV is to reduced to some reasonable

level. This might imply searching for alternative means to the current commodity-specific price stabilisation schemes for trying to curb CERV in the selected SPINs. This could be expensive in the short run and might therefore call for external funding. The possible alternatives to be considered include, among others, volume buffer stock schemes, commodity diversification, contract and futures markets, and the diversification of market outlets into new market frontiers and partnerships.

REFERENCES

Adams, F.G. and Behrman, J.R. (1982), Commodity Exports and Economic Development - The Commodity Problem and Policy in Developing Countries, Heath, Lexington.

AIDAB (1991a), Papua New Guinea, Economic Situation and Outlook, International Development Issue No. 16, Australian Government Publishing Service, Canberra.

AIDAB (1991b), The Solomon Islands Economy, Prospects for Stabilisation and Sustainable Growth, International Development Issue No. 21, Australian Government Publishing Service, Canberra.

Anon. (1962-70), Fiji Reports 1960-69, Her Majesty's Stationery Office, Government Printer, Suva.

Australian Government (1973 and previous issues), Compendium of Statistics 1972 and 1973 for PNG, Department of External Territories, Statistics Section, Canberra.

Australian National University (1992), Pacific Economic Bulletin 7(2), The National Centre for Development Studies, Canberra.

Bank of PNG (1972-91), Quarterly Economic Bulletin, Port Moresby.

Beck, A. and Dalton, M. (1987), 'Commodity price stabilisation in PNG: a study of coffee, cocoa, copra and palm oil industries - overview paper', in B. Brogan and J. Remenyi (eds), A Work-in-Progress Seminar on Commodity Price Stabilisation in PNG, Institute of National Affairs, Discussion Paper No. 27, 11-30.

Borhnstedt, G.W. and Goldberger, A.S. (1969), 'Statistical analysis of identities in random variables', American Journal of Agricultural Economics 50(3), 734-44.

British SI Protectorate (1971), Sixth Development Plan 1971-73, Government Printer, Honiara.

Burt, O.R. and Finley, R.M. (1968), 'On the exact covariance of products of random variables', Journal of American Statistical Association 50(3), 734-44.

Carter, J. (ed.) (1981), Pacific Islands Yearbook, 14th edition, Pacific Publications, Sydney.

Central Bank of SI (1992), Quarterly Review 3(2), Honiara.

Fiji Government (1982, 1991), Current Economic Statistics, Bureau of Statistics, Suva.

Fleming E.M. and Piggott, R.R. (1985), 'Analysis of export earnings instability in the South Pacific region', Singapore Economic Review 30(1), 14-33.

Fleming, E.M. and Piggott, R.R. (1989), 'Assessment of policy options for agricultural export stabilization in the South Pacific', Journal of Developing Areas 23(2), 271-89.

Government of PNG (various issues), Summary of Statistics, National Statistical Office, Port Moresby.

Hazell, P.B.R. (1984), 'Sources of increased instability in Indian and US cereal production', American Journal of Agricultural Economics 66(3), 302-11.

Houck, J.P. (1973), 'Some aspects of income stabilisation for primary producers', Australian Journal of Agricultural Economics 17(3), 200-215.

IMF (1990-92), International Financial Statistics Yearbook, Washington, D.C..

Inder, S. (ed.) (1977, 1978), Pacific Islands Yearbook, 12th and 13th editions, Pacific Publications, Sydney.

Kiele, L.J. (1987), 'The commodity price stabilization schemes for PNG's major export crops: some macroeconomic considerations', in B. Brogan and J.V. Remenyi (eds), A Work-in-Progress Seminar on Commodity Price Stabilisation in PNG, Institute of National Affairs, Discussion Paper No. 27, 3-10.

Lam, N.V. (1984), The Commodity Export Sector in Papua New Guinea, Monograph 22, Hong Kong.

Myers, R.J. and Runge, C.F. (1985), 'The relative contribution of supply and demand to instability in the US corn market', North-Central Journal of Agricultural Economics 7(1), 70-78.

Myers, R.J., Piggott, R.R. and Tomek, W.G. (1990), 'Estimating sources of fluctuation in the Australian wool market: an application of VAR methods', Australian Journal of Agricultural Economics 34(3), 242-62.

NCDS (1991), South Pacific Economic and Social Database, National Centre for Development Studies, Canberra.

Offutt, S.E. and Blandford, D. (1983), A Review of Empirical Techniques for the Analysis of Commodity Instability, Agricultural Economics Research 83-7, Cornell University.

Piggott, R.R. (1978), 'Decomposing the variance of gross revenue into demand and supply components', Australian Journal of Agricultural Economics 22(3), 145-57.

Piggott, R.R. (1981), 'Some thoughts on research possibilities in the area of trade instability', in C.W. Maughan (ed.), Proceedings of a Workshop on Australian and New Zealand Exports to Pacific Basin Countries, Centre for Agricultural Policy Studies, Massey University, Palmerston North, New Zealand, 122-6.

Piggott, R.R., Fleming, E.M. and Kunert, A. (1986), Causes of export market instability and problems of policy design: some methodology with implications to South Pacific countries, Paper contributed to the 30th Annual Conference of the Australian Agricultural Economics Society, Canberra.

SI Government (1962-75), British SI Reports 1959-73, Her Majesty's Stationery office, London and Honiara.

SI Government (1984 and previous issues), 1979, 81, 82 and 83 Statistical Year-Book, Statistical Bulletin No 24/79, 32/81, 33/82, 22/84, Government Printer, Honiara.

Tudor, J. (ed.) (1963, 1972), Pacific Islands Year-Book, 9th and 11th editions, Pacific Publications, Sydney.

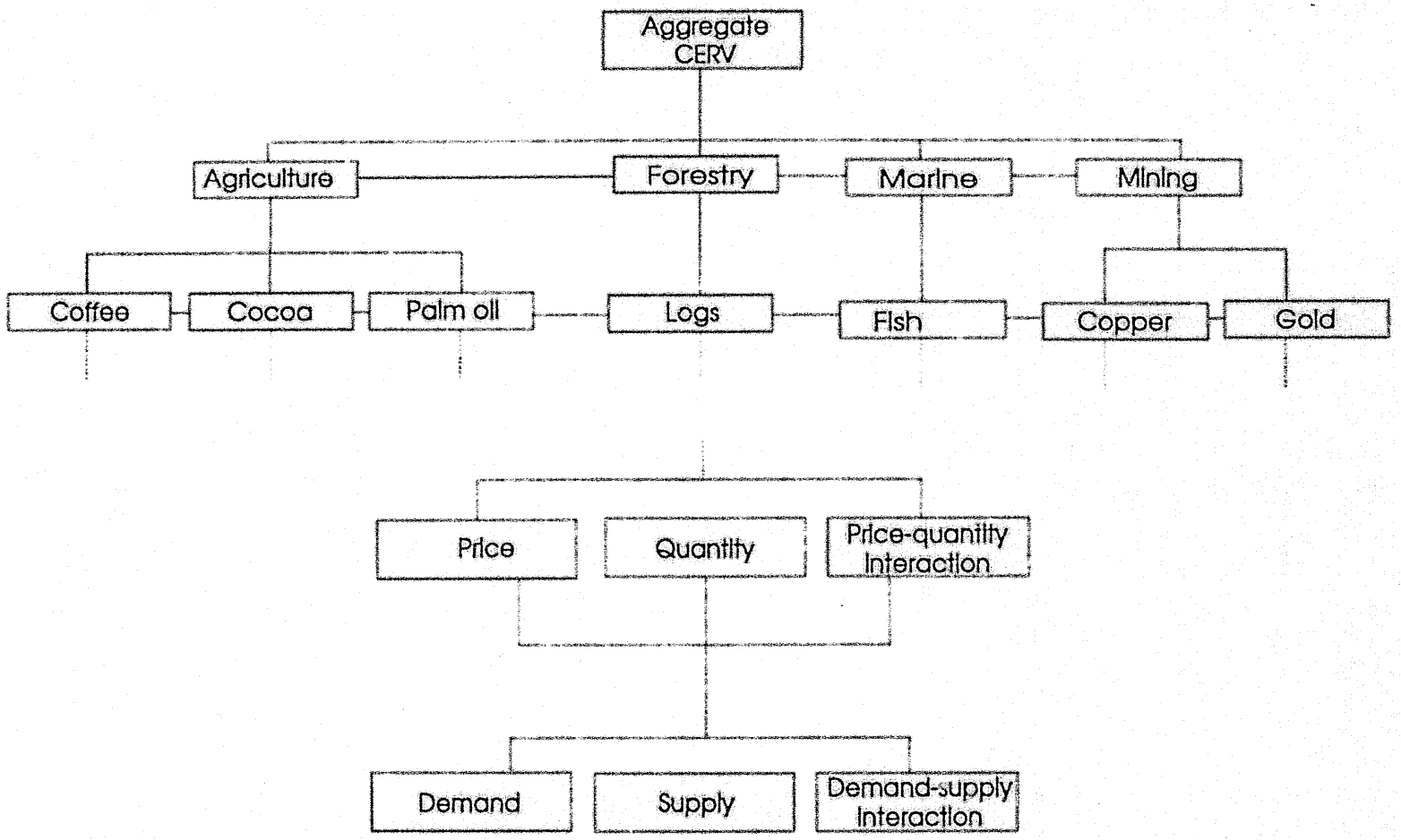

Figure 1. An Illustration of a Diagramatic Representation of Aggregate CERV Decomposition

Table 1 Major commodity exports as a proportion of total exports for Fiji, 1961-90

Year	Commodities					
	Sugar	Molas[a]	Co Oil[b]	*Agr[c]*	*Gold*	*Forest*
				subt[d]1	*subt[d]2*	*subt[d]3*
1961-65	58.02	0.71	10.10	*68.83*	*7.26*	0.30
1965-70	53.01	0.95	7.87	*61.83*	*6.81*	0.87
1971-75	54.49	0.90	5.97	*61.36*	*6.33*	0.50
1976-80	54.73	2.39	4.41	*61.53*	*3.99*	0.84
1981-85	44.36	2.31	3.68	*50.35*	*6.49*	0.94
1986-90	40.89	2.33	0.85	*44.07*	*12.98*	2.46

Year	Fish	Other	Total
	subt[d]4		
1961-65	-	23.61	100.00
1965-70	-	30.49	100.00
1971-75	0.04	31.77	100.00
1976-80	3.32	30.32	100.00
1981-85	5.02	37.20	100.00
1986-90	6.19	34.30	100.00

Source: Computed from various sources quoted in the data sub-section of this paper.

Notes:

[a] Molas = molasses
[b] Co oil = coconut oil
[c] Agr = agriculture
[d] subt = subtotal

Table 2 Major commodity exports as a proportion of total exports for PNG, 1961-90

	Commodities					
Year	Coffee	Cocoa	Copra	Co oil[a]	Rubber	Tea
1961-65	13.60	14.20	27.16	12.74	6.30	0.03
1965-70	22.02	18.56	18.68	8.92	3.42	0.49
1971-75	12.00	8.08	6.04	3.50	1.08	1.06
1976-80	21.26	10.58	4.18	2.42	0.56	1.39
1981-85	13.36	6.52	3.76	2.92	0.38	1.46
1986-90	12.50	4.22	1.20	1.24	0.28	0.58

	P.oil[b]	*Agr[c]*	Logs	*Forest*	*Marine*	Copper
		subt[d]1		*subt[d]2*	*subt[d]3*	
1961-65	-	*74.03*	1.45	*3.06*	*1.95*	-
1965-70	-	*72.09*	2.42	*3.91*	*1.89*	-
1971-75	1.00	*32.76*	2.83	*4.05*	*2.97*	48.11
1976-80	1.81	*42.20*	2.63	*3.60*	*4.05*	24.83
1981-85	5.13	*33.53*	7.07	*7.08*	*2.00*	20.60
1986-90	2.80	*22.82*	7.38	*7.38*	*0.77*	27.81

Source: Computed from various sources quoted in the data sub-section of this paper.

Notes:

[a] Co oil = coconut oil
[b] P. oil = palm oil
[c] Agr = agriculture
[d] subt = subtotal

Table 2 (continued) PNG, 1961-90

Year	Commodities			
	Gold	*Minerals*	Other	Total
		subt[d]*4*		
1961-65	-	-	20.96	100.00
1965-70	-	-	22.11	100.00
1971-75	0.58	*48.69*	11.53	100.00
1976-80	17.10	*41.93*	8.22	100.00
1981-85	28.97	*49.57*	7.82	100.00
1986-90	34.64	*62.45*	6.58	100.00

Source: Computed from various sources quoted in the data sub-section of this paper.

Note:

[d] subt = subtotal

Table 3 Major commodity exports as a proportion of total exports for SI, 1961-90

Year	Commodities					
	Copra	Cocoa	P.O & K[a]	*Agr[b]*	*Forest*	Fish
				subt[c]1	*subt[c]2*	
1961-65	87.65	0.31	-	*87.96*	*5.85*	-
1965-70	64.45	0.69	-	*65.14*	*27.38*	-
1971-75	36.06	0.54	-	*36.60*	*31.10*	22.57
1976-80	24.12	1.37	11.22	*36.71*	*26.51*	30.92
1981-85	17.91	2.80	13.21	*33.92*	*29.10*	32.21
1986-90	7.84	5.62	8.39	*21.85*	*28.37*	40.52

	Marine	*Minerals*	Other	Total
	subt[c]3	*subt[c]4*		
1961-65	*1.72*	*0.18*	4.29	100.00
1965-70	*1.13*	*0.27*	6.08	100.00
1971-75	*23.56*	*0.40*	8.34	100.00
1976-80	*31.55*	*0.41*	4.82	100.00
1981-85	*32.76*	*0.78*	3.44	100.00
1986-90	*43.10*	*1.16*	5.52	100.00

Source: Computed from various sources quoted in the data sub-section of this paper.

Notes:

[a] P. O & K = palm oil & kernel
[b] Agr = agriculture
[c] subt = subtotal

Table 4 Percentage variance contribution to CERV by individual sectors for 10, 15 and 30-year sub-periods - Fiji

	Sub-periods					
Sectors	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
Agr[a]	95.90	86.86	47.75	90.72	48.21	59.59
Mng[b]	0.24	0.27	10.69	0.78	10.60	5.75
Frt[c]	0.05	0.05	0.59	0.01	0.50	0.26
Mrn[d]	-	0.74	2.15	0.00	2.27	1.66
Subtotal	*96.19*	*87.92*	*59.17*	*91.51*	*61.58*	*67.26*
Interactive						
Agr-Mng	2.91	3.81	19.54	7.69	19.10	15.72
Agr-Frt	0.83	1.80	4.52	0.57	4.19	3.30
Agr-Mrn	-	6.14	8.75	0.15	8.99	8.98
Mng-Frt	0.07	0.08	2.45	0.07	0.50	1.20
Mng-Mrn	-	0.12	4.52	0.01	4.65	2.93
Frt-Mrn	-	0.13	1.05	0.00	0.99	0.61
Subtotal	*3.81*	*12.08*	*40.83*	*8.49*	*38.42*	*32.74*
Total	100.00	100.00	100.00	100.00	100.00	100.00

Notes:

[a] Agr = agriculture
[b] Mng = mining
[c] Frt = forestry
[d] Mrn = marine

Table 5 Percentage variance contribution to CERV by individual sectors for 10, 15 and 30-year sub-periods - PNG

	Sub-periods					
Sectors	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
Agr[a]	90.64	31.02	9.26	6.21	6.16	10.48
Mng[b]	-	39.81	81.57	69.56	81.60	59.41
Frt[c]	0.43	0.26	1.00	0.13	1.42	0.90
Mrn[d]	0.18	0.36	0.07	0.10	0.11	0.06
Subtotal	*91.25*	*71.45*	*91.90*	*76.00*	*88.87*	*70.85*
Interactive						
Agr-Mng	-	19.72	1.38	17.86	2.81	18.71
Agr-Frt	5.66	2.26	1.22	0.83	0.93	2.39
Agr-Mrn	2.88	2.17	-0.25	0.69	-0.24	0.47
Mng-Frt	-	2.20	6.95	2.52	9.36	6.79
Mng-Mrn	-	1.94	-1.06	1.99	-1.49	0.72
Frt-Mrn	0.23	0.26	-0.14	0.11	-0.24	0.07
Subtotal	*8.75*	*28.55*	*8.10*	*24.00*	*11.13*	*29.15*
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Notes:

[a] Agr = agriculture
[b] Mng = mining
[c] Frt = forestry
[d] Mrn = marine

Table 6 Percentage variance contribution to CERV by individual sectors for 10, 15 and 30-year sub-periods - SI

	Sub-periods					
Sectors	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
Agr[a]	10.57	28.95	15.13	26.15	11.99	11.76
Mng[b]	0.00	0.02	0.03	0.01	0.03	0.02
Frt[c]	51.89	0.13	12.92	21.78	13.33	13.09
Mrn[d]	0.09	27.60	38.20	17.78	33.62	29.38
Subtotal	*62.55*	*56.70*	*66.28*	*65.72*	*58.97*	*54.25*
Interactive						
Agr-Mng	0.02	0.40	-0.03	0.23	0.21	0.32
Agr-Frt	37.47	0.18	6.76	10.06	8.79	10.72
Agr-Mrn	-0.21	23.55	9.44	9.13	12.50	15.26
Mng-Frt	0.10	0.35	0.33	0.26	0.45	0.44
Mng-Mrn	-0.00	0.56	0.74	0.22	0.79	0.69
Frt-Mrn	0.07	18.26	16.48	14.38	18.29	18.32
Subtotal	*37.45*	*43.30*	*33.48*	*34.28*	*41.03*	*45.75*
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Notes:

[a] Agr = agriculture
[b] Mng = mining
[c] Frt = forestry
[d] Mrn = marine

Table 7 Percentage variance contribution to CERV by individual commodities for 10, 15 and 30-year sub-periods - Fiji

	Sub-periods					
Coms[a]	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
SG[b]	88.54	76.73	43.99	83.64	44.34	53.50
ML[c]	0.03	0.58	0.23	0.02	0.27	0.25
CO[d]	1.20	0.38	0.31	0.76	0.23	0.14
GD[e]	0.24	0.30	10.78	0.83	10.59	5.98
FT[f]	0.05	0.05	0.59	0.01	0.50	0.27
MN[g]	-	0.81	2.17	0.00	2.27	1.73
Subtotal	*90.06*	*78.85*	*58.07*	*85.26*	*58.20*	*61.87*
Interactive						
SG-ML	0.88	5.99	2.88	1.19	3.18	3.51
SG-CO	4.97	2.34	-1.97	4.47	-1.42	0.52
SG-GD	2.84	3.79	19.45	7.44	18.65	15.42
SG-FT	0.66	1.75	4.46	0.52	4.07	3.23
SG-MN	-	5.78	8.63	0.15	8.65	8.71
ML-CO	0.04	0.18	-0.12	0.09	-0.08	0.03
ML-GD	0.07	0.26	1.20	0.13	1.20	0.99
ML-FT	0.03	0.17	0.28	0.01	0.27	0.21
ML-MN	-	0.06	0.53	0.00	0.58	0.58
CO-GD	0.18	0.09	-0.97	0.58	-0.76	-0.05
CO-FT	-0.01	0.04	-0.19	0.08	-0.15	-0.01
CO-MN	-	0.34	-0.34	0.00	-0.25	0.05
GD-FT	0.08	0.10	2.47	0.07	2.22	1.25
GD-MN	-	0.12	4.56	0.01	4.65	3.05
FT-MN	-	0.14	1.06	0.00	0.99	0.64
Subtotal	*9.94*	*21.15*	*41.93*	*14.74*	*41.81*	*38.13*
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Notes: [a] Coms = commodities, [b] SG = sugar, [c] ML = molasses, [d] CO = coconut oil, [e] GD = gold, [f] FT = forestry, [g] MN = marine

Table 8 Percentage variance contribution to CERV by individual commodities for 10, 15 and 30-year sub-periods - PNG

	Sub-periods					
Coms[a]	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
CF[b]	26.60	9.71	3.31	0.82	1.76	3.04
CC[c]	13.32	2.33	0.37	0.66	0.39	0.50
CR[d]	3.29	0.37	0.33	0.20	0.21	0.09
CO[e]	0.92	0.10	0.16	0.06	0.09	0.05
RB[f]	0.04	0.00	0.00	0.00	0.00	0.00
LG[g]	0.33	0.26	1.10	0.07	1.57	0.99
FT[h]	0.56	0.03	1.10	0.13	1.37	0.94
MN[i]	0.23	0.36	0.08	0.09	0.11	0.07
TE[j]	0.09	0.05	0.03	0.01	0.01	0.02
PO[k]	-	0.90	0.78	0.04	6.26	0.36
CP[l]	-	25.44	28.78	69.28	17.61	15.08
GD[m]	-	21.36	24.21	-	28.27	21.58
Subtotal	*45.38*	*60.91*	*60.25*	*71.36*	*57.65*	*42.72*
Interactive[n]						
Subtotal	*54.62*	*39.09*	*39.75*	*28.64*	*42.35*	*57.28*
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Notes: [a] Coms = commodities, [b] CF = coffee, [c] CC = cocoa, [d] CR = copra, [e] CO = coconut oil, [f] RB = rubber, [g] LG = logs, [h] FT = forestry, [i] MN = marine, [j] TE = tea, [k] PO = palm oil, [l] CP = copper, [m] GD = gold.

[n] Interactions - there were 66 commodity interactions but are not reported. Their details are available on request.

Table 9 Percentage variance contribution to CERV by individual commodities for 10, 15 and 30-year sub-periods - SI

	Sub-periods					
Coms[a]	1961-70	1971-80	1981-90	1961-75	1976-90	1961-90
Direct						
CR[b]	15.42	4.75	3.01	15.77	1.79	1.39
FT[c]	77.66	5.89	6.90	13.35	7.17	7.18
CC[d]	0.02	0.02	0.50	0.00	0.42	0.29
MN[e]	0.13	12.67	20.40	10.91	18.08	16.10
GD[f]	0.00	0.01	0.02	0.00	0.01	0.01
FS[g]	-	12.09	17.16	12.07	15.57	14.25
PK[h]	-	2.18	1.16	-	1.02	1.12
Subtotal	*93.23*	*37.61*	*49.15*	*52.10*	*44.06*	*40.34*
Interactive						
CR-FT	4.32	4.37	0.29	5.97	0.97	1.94
CR-CC	0.19	0.24	0.04	0.13	0.18	0.32
CR-MN	-0.32	5.62	0.26	5.49	1.34	2.75
CR-GD	0.02	0.09	-0.06	0.14	0.00	0.05
CR-FS	-	5.50	0.24	5.91	1.26	2.61
CR-PK	-	2.75	1.32	-	0.98	1.05
FT-CC	1.29	0.28	1.76	0.20	1.64	1.36
FT-MN	1.13	8.38	8.51	8.82	9.83	10.04
FT-GD	0.14	0.16	0.18	0 16	0.24	0.24
FT-FS	-	8.18	7.72	9.28	8.98	9.40
FT-PK	-	3.39	1.75	-	2.13	2.57
CC-MN	0.01	0.40	2.68	0.11	2.48	2.00
CC-GD	0.00	0.01	0.06	0.00	0.06	0.05
CC-FS	-	0.38	2.44	0.14	2.27	1.87
CC-PK	-	0.19	0.38	-	0.45	0.46
MN-GD	-0 01	0.26	0.40	0.13	0.43	0.38
MN-FS	-	12.36	18.68	11.26	16.75	15.14
MN-PK	-	4.80	2.10	-	2.90	3.62
GD-FS	-	0.26	0.38	0.16	0.40	0.36
GD-PK	-	0.09	-0.03	-	0.04	0.07
FS-PK	-	4.68	1.75	-	2.62	3.38
Subtotal	*6.77*	*62.39*	*50.85*	*47.90*	*55.94*	*59.66*
Total	100.00	100.00	100.00	100.00	100.00	100.00

Notes: [a] Coms = commodities, [b] CR = copra, [c] CC = cocoa, [d] MN = marine, [e] GD = gold, [f] FS = fish, [g] PK = palm oil & kernel

Table 10 The best guessed estimates of price elasticities of annual demand and supply for the commodities of the SPINs

Commodities	Price elasticity of: demand	supply
Coffee*	-100	0.05
Cocoa*	-100	0.05
Copra*	-100	0.30
Copra/Coconut oil*	-100	0.15
Rubber	-90	0.15
Tea	-100	0.05
Palm oil & kernel*	-100	0.10
Sugar*	-100	0.10
Molasses*	-50	0.20
Logs	-85	0.01
Forestry	-90	0.01
Marine	-80	0.05
Fish	-85	0.05
Copper	-95	0.01
Gold	-95	0.01

Source: * Fleming and Piggott (1989)

Table 11 Percentage relative contribution of demand, supply and demand-supply interaction effects (IE) to price, volume and revenue variability in Fiji, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	30-years (1961-90)			15-years (1961-75)		
Sugar						
DE	36.45	0.00	15.33	19.94	0.00	12.52
SE	125.35	99.95	6.91	50.06	100.06	5.68
IE	-61.80	0.05	77.76	30.00	-0.06	81.80
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Molasses						
DE	141.22	0.00	44.52	37.69	0.00	27.99
SE	281.73	99.94	19.42	56.71	100.00	17.56
IE	-322.95	0.06	36.06	5.60	0.00	54.45
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	83.49	0.05	326.57	88.31	0.08	175.87
SE	1.42	103.25	526.02	1.01	103.18	189.64
IE	15.09	-3.30	-762.59	10.68	-3.26	-265.51
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	99.71	5.53	105.97	99.42	18.86	167.36
SE	0.00	109.58	17.81	0.00	186.24	13.96
IE	0.29	-15.11	-23.78	0.58	-105.10	-81.32
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	100.98	7.65	49.62	99.90	9.34	84.99
SE	0.01	69.91	25.64	0.01	93.21	47.88
IE	-0.99	22.44	24.74	0.09	-2.55	-32.87
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 11 (Continued) Fiji, 30 and 15-year sub-period

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	30-years (1961-90)			15-years (1961-75)		
Marine						
DE	102.25	0.90	31.63	102.26	1.02	90.60
SE	0.02	83.21	25.02	0.01	80.80	210.23
IE	-2.27	15.89	43.35	-2.27	18.18	-200.83
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 11 (Continued) Fiji, 15 and 10-year sub-period

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Sugar						
DE	9.65	0.00	3.93	1.80	0.00	1.13
SE	114.01	99.98	4.77	93.81	100.00	10.59
IE	-23.66	0.02	91.30	4.39	-0.00	88.28
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Molasses						
DE	33.61	0.00	13.47	0.86	0.00	0.58
SE	153.11	99.97	9.77	106.00	99.99	29.99
IE	-86.72	0.03	76.76	-6.86	0.01	69.43
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	88.55	0.06	69.38	69.77	0.01	32.93
SE	1.37	102.21	158.83	6.52	101.09	302.34
IE	10.08	-2.27	-128.21	23.71	-1.10	-235.27
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	101.71	0.50	25.06	99.61	1.31	76.80
SE	0.02	91.38	38.51	0.01	103.41	51.19
IE	-1.73	8.12	36.43	0.38	-4.72	-27.99
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	100.53	6.04	48.92	101.35	6.15	52.64
SE	0.02	84.16	37.30	0.01	69.04	34.18
IE	-0.55	9.80	13.78	-1.36	24.81	13.18
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 11 (Continued) Fiji, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Marine						
DE	101.92	0.74	32.96	-	-	-
SE	0.02	87.99	33.01	-	-	-
IE	-1.94	11.27	34.03	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 11 (Continued) Fiji, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Sugar						
DE	9.62	0.00	3.97	16.79	0.00	6.18
SE	98.66	99.99	5.86	99.77	99.98	3.56
IE	-8.28	0.01	90.17	-16.56	0.02	90.26
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Molasses						
DE	312.48	0.00	60.66	21.84	0.00	9.06
SE	593.78	99.94	29.57	99.70	99.99	6.10
IE	-806.26	0.06	9.77	-21.54	0.01	84.84
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	86.77	0.12	308.05	90.40	0.08	71.78
SE	0.69	105.69	308.82	1.07	102.37	149.15
IE	12.54	-5.81	-516.87	8.53	-2.45	-120.93
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	99.00	4.38	214.99	104.23	0.19	11.68
SE	0.00	137.58	57.20	0.06	92.54	48.80
IE	1.00	-41.96	-172.19	-4.29	7.27	39.52
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	101.30	1.53	20.00	100.07	6.84	56.67
SE	0.07	92.28	65.70	0.02	91.39	41.21
IE	-1.37	6.19	14.30	-0.09	1.77	2.12
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 11 (Continued) Fiji, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Marine						
DE	102.52	0.48	25.55	101.89	0.80	30.45
SE	0.03	89.94	40.66	0.02	87.17	27.87
IE	-2.55	9.58	33.79	-1.91	12.03	41.68
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 12 Percentage relative contribution of demand, supply and demand-supply interaction effects to price, volume and revenue variability in PNG, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	30-years (1961-90)			15-years (1961-75)		
Coffee						
DE	108.63	0.00	69.23	22.29	0.00	19.72
SE	61.96	99.94	227.45	48.44	100.03	718.55
IE	-70.59	0.06	-196.68	29.27	-0.03	-638.27
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	110.41	0.00	70.60	156.78	0.00	29.51
SE	7.16	99.92	61.28	28.13	99.91	96.61
IE	-17.57	0.08	-31.88	-84.91	0.09	-26.12
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Copra						
DE	63.94	0.01	126.94	52.45	0.00	167.11
SE	9.32	100.86	100.56	12.42	100.85	225.45
IE	26.74	-0.87	-127.50	35.13	-0.85	-292.56
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Coconut Oil						
DE	100.28	7.97	72.47	99.84	21.79	107.87
SE	0.00	77.06	12.15	0.00	101.76	8.72
IE	-0.28	14.97	15.38	0.16	-23.55	-16.59
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Rubber						
DE	98.72	4.23	191.82	98.94	6.43	187.67
SE	0.01	128.56	100.85	0.01	134.51	67.82
IE	1.27	-32.79	-192.67	1.05	-40.94	-155.49
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	30-years (1961-90)			15-years (1961-75)		
Logs						
DE	102.30	3.62	31.51	97.79	0.28	6.90
SE	0.02	68.48	24.51	0.30	101.60	99.16
IE	-2.32	27.90	43.98	1.91	-1.88	-6.06
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	102.63	2.90	24.06	96.63	1.02	26.08
SE	0.03	74.54	33.60	0.12	109.33	132.66
IE	-2.66	22.56	42.34	3.25	-10.35	-58.74
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	97.57	0.48	81.84	96.92	0.26	43.23
SE	0.03	109.03	156.75	0.06	106.24	149.29
IE	2.40	-9.51	-138.59	3.02	-6.50	-92.52
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Tea						
DE	100.63	0.10	28.73	100.03	0.05	20.44
SE	0.02	98.63	67.15	0.05	99.86	88.13
IE	-0.65	1.27	4.12	-0.08	0.09	-8.57
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Palm Oil						
DE	101.52	0.54	27.83	101.60	0.91	35.57
SE	0.02	91.32	39.93	0.01	84.77	28.71
IE	-1.54	8.14	32.24	-1.61	14.32	35.72
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period		30-years (1961-90)			15-years (1961-75)	
Copper						
DE	101.49	1.22	38.04	101.98	0.84	31.98
SE	0.01	81.64	21.54	0.01	83.47	27.10
IE	-1.50	17.14	40.42	-1.99	15.69	40.92
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	101.55	1.12	36.57	-	-	-
SE	0.01	82.48	22.87	-	-	-
IE	-1.56	16.40	40.56	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Coffee						
DE	44.21	0.00	158.59	22.90	0.00	4.21
SE	26.41	100.06	414.23	35.48	100.06	290.01
IE	29.38	-0.06	-472.82	41.62	-0.06	-194.22
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	69.13	0.00	144.79	89.33	0.00	21.74
SE	7.84	100.10	180.50	23.53	99.99	158.11
IE	23.03	-0.10	-225.29	-12.86	0.01	-79.85
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Copra						
DE	68.18	0.01	112.14	37.30	0.00	37.98
SE	10.34	100.62	88.38	21.91	100.56	104.09
IE	21.48	-0.63	-100.52	40.79	-0.56	-42.07
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Coconut Oil						
DE	99.87	18.02	105.11	99.54	14.18	136.26
SE	0.00	97.81	9.88	0.00	129.77	21.59
IE	0.13	-15.83	-14.99	0.46	-43.95	-57.85
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Rubber						
DE	99.79	1.82	55.44	98.26	3.92	441.96
SE	0.02	100.23	52.84	0.01	137.53	268.04
IE	0.19	-2.05	-8.28	1.73	-41.45	-610.00
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Logs						
DE	101.87	4.91	39.95	92.66	0.44	15.02
SE	0.01	64.26	21.64	0.20	111.01	152.01
IE	-1.88	30.83	38.41	7.14	-11.45	-67.03
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	102.28	4.05	30.49	95.78	2.23	104.55
SE	0.02	68.66	28.05	0.06	126.89	286.89
IE	-2.30	27.29	41.46	4.16	-29.12	-291.44
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	97.44	0.70	181.44	97.74	0.37	57.92
SE	0.02	113.93	249.97	0.04	106.38	140.16
IE	2.54	-14.63	-331.41	2.22	-6.75	-98.08
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Tea						
DE	100.10	1.70	82.81	102.23	0.06	15.89
SE	0.00	94.75	10.66	0.04	97.24	59.10
IE	-0.10	3.55	6.53	-2.27	2.70	25.01
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Palm Oil						
DE	99.78	0.32	30.25	-	-	-
SE	0.03	100.29	79.85	-	-	-
IE	0.19	-0.61	-10.10	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 12 (Continued) PNG, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Copper						
DE	100.19	14.30	83.54	-	-	-
SE	0.00	59.95	2.95	-	-	-
IE	-0.19	25.75	13.51	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-
Gold						
DE	100.35	1.74	61.04	-	-	-
SE	0.00	92.43	27.51	-		-
IE	-0.35	5.83	11.45	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Coffee						
DE	121.72	0.00	87.60	46.72	0.00	148.28
SE	7.67	99.81	40.72	29.14	100.04	366.45
IE	-29.39	0.19	-28.32	24.14	-0.04	-414.73
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	92.28	0.00	105.10	65.16	0.00	132.09
SE	1.50	100.17	22.69	12.18	100.06	244.56
IE	6.22	-0.17	-27.79	22.66	0.06	-276.65
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Copra						
DE	59.88	0.01	104.10	65.16	0.01	127.69
SE	8.16	101.18	68.18	10.39	100.70	112.47
IE	31.96	-1.19	-72.40	24.45	-0.71	-140.16
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Coconut Oil						
DE	99.96	30.23	100.57	99.80	96.44	118.09
SE	0.00	78.09	4.51	0.00	134.35	2.85
IE	0.04	-8.32	-5.08	0.20	-130.79	-20.94
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Rubber						
DE	98.75	8.43	269.15	126.02	1.26	41.83
SE	0.01	155.19	86.16	0.02	98.40	56.37
IE	1.24	-63.62	-255.31	-0.04	0.34	1.80
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Logs						
DE	100.10	30.55	88.11	101.14	7.74	51.78
SE	0.00	59.00	6.99	0.01	62.35	16.99
IE	-0.10	10.45	4.90	-1.15	29.91	31.23
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	99.98	27.28	89.79	100.97	11.13	55.91
SE	0.00	74.28	13.38	0.00	56.72	15.45
IE	0.02	-1.56	-3.17	-0.97	32.15	28.64
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	100.56	0.82	40.90	95.32	0.14	202.05
SE	0.02	95.39	40.31	0.11	105.13	662.60
IE	-0.58	3.79	18.79	4.57	-5.27	-764.65
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Tea						
DE	100.56	0.04	12.32	100.21	2.30	77.07
SE	0.07	99.50	76.39	0.00	87.85	6.80
IE	-0.63	0.46	11.29	-0.21	9.85	16.13
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Palm Oil						
DE	101.39	0.68	36.41	99.89	1.34	65.58
SE	0.01	89.93	40.76	0.00	100.11	41.27
IE	-1.40	9.39	22.83	0.11	-1.45	-6.85
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 12 (Continued) PNG, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Copper						
DE	100.55	0.63	41.88	100.31	13.05	77.85
SE	0.02	95.99	54.01	0.00	48.17	2.42
IE	-0.57	3.38	4.11	-0.31	38.78	19.73
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	100.65	1.94	58.84	104.32	0.14	9.92
SE	0.01	85.99	22.34	0.08	94.38	57.60
IE	-0.66	12.07	18.82	-4.40	5.48	32.48
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect, IE = Interaction effect

Table 13 Percentage relative contribution of demand, supply and demand-supply interaction effects to price, volume and revenue variability in SI, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	30-years (1961-90)			15-years (1961-75)		
Copra						
DE	96.54	0.08	87.56	84.22	0.06	183.51
SE	1.05	100.61	44.89	1.40	103.12	195.19
IE	2.41	-0.69	-32.45	14.38	-3.18	-278.70
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	28.84	0.00	11.92	3.42	0.00	2.44
SE	138.64	99.97	7.12	101.92	100.00	15.39
IE	-67.48	0.03	80.96	-5.34	0.00	82.17
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	107.14	0.01	10.19	100.29	2.65	22.19
SE	0.31	98.79	62.56	0.00	81.98	168.98
IE	-7.45	1.20	27.25	-0.29	15.37	-91.17
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	101.64	1.00	35.84	103.27	0.12	9.74
SE	0.01	86.03	26.28	0.13	96.74	66.66
IE	-1.65	12.97	37.88	-3.40	3.14	23.60
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	100.75	2.17	56.18	101.22	0.91	43.58
SE	0.00	82.33	42.63	0.01	88.54	749.77
IE	-0.75	15.50	1.19	-1.23	10.55	-693.35
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 13 (Continued) SI, 30 and 15-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period		30-years (1961-90)			15-years (1961-75)	
Fish						
DE	101.49	1.22	39.53	101.73	0.90	35.70
SE	0.01	83.49	23.05	0.01	86.02	29.46
IE	-1.50	15.29	37.42	-1.74	13.08	34.84
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Palm oil & kernel						
DE	101.36	1.08	37.35	-	-	-
SE	0.01	84.38	24.83	-	-	-
IE	-1.37	14.54	37.82	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 13 (Continued) SI, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976-90)			10-years (1961-70)		
Copra						
DE	91.72	0.04	102.32	70.16	0.02	127.16
SE	1.91	100.96	77.52	3.85	102.05	481.48
IE	6.37	-1.00	-79.84	25.99	-2.07	-508.64
Total	*100.00*	*100.00*	*100.00*	*100 00*	*100.00*	*100.00*
Forestry						
DE	15.55	0.00	6.47	3.39	0.00	-17.81
SE	87.19	100.00	3.71	94.12	100.00	-181.81
IE	-2.74	0.00	89.82	2.49	-0.00	299.62
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	110.59	0.00	4.64	100.19	3.86	26.08
SE	1.03	99.44	84.51	0.00	81.09	505.74
IE	-11.62	0.56	10.85	-0.19	15.05	-431.82
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	100.34	2.39	67.26	99.13	0 51	48.55
SE	0.01	90.94	21.71	0.03	102.93	81.33
IE	-0.35	6.67	11.03	0.84	-3.44	-29.88
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	100.50	1.37	56.73	96.11	0.05	64.74
SE	0.01	92.05	55.89	0.02	101.89	211.30
IE	-0.51	6.58	-12.62	3.69	-1.94	-176.04
Total	*100.00*	*100.00*	*100.00*	*100 00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 13 (Continued) SI, 15 and 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	15-years (1976 [illegible])			10-years (1961-70)		
Fish						
DE	100.42	2.00	62.42	-	-	-
SE	0.01	90.81	23.91	-	-	-
IE	-0.43	7.19	13.67	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-
Palm oil & kernel						
DE	100.11	1.30	65.64	-	-	-
SE	0.01	97.11	41.33	-	-	-
IE	-0.12	1.59	-6.97	-	-	-
Total	*100.00*	*100.00*	*100.00*	-	-	-

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 13 (Continued) SI, 10-year sub-periods

	% contribution to variance of:					
Coms[a]	Price	Volume	Revenue	Price	Volume	Revenue
Sub-period	10-years (1971-80)			10-years (1981-90)		
Copra						
DE	93.11	0.06	91.63	88.68	0.04	102.51
SE	1.32	101.23	66.96	2.24	101.19	85.90
IE	5.57	-1.28	-58.59	9.08	-1.23	-88.41
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Forestry						
DE	111.56	0.00	92.06	7.44	0.00	3.16
SE	22.48	99.95	2.80	70.91	100.02	2.75
IE	-34.04	0.05	5.14	21.65	-0.02	94.09
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Cocoa						
DE	100.23	2.49	38.96	109.81	0.00	8.09
SE	0.00	86.28	39.66	0.55	99.07	75.62
IE	-0.23	11.23	21.23	-10.36	0.93	16.29
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Marine						
DE	102.10	0.53	27.26	99.70	3.73	99.97
SE	0.03	90.65	39.49	0.00	105.11	23.84
IE	-2.13	8.82	33.25	0.30	-8.84	-23.81
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Gold						
DE	100.21	10.75	88.16	99.64	1.23	77.24
SE	0.00	68.06	127.01	0.01	102.86	87.31
IE	-0.21	21.10	-115.17	0.35	-4.09	-64.55
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect

Table 13 (Continued) SI, 10-year sub-periods

Coms[a]	% contribution to variance of: Price	Volume	Revenue	Price	Volume	Revenue
Sub-period		10-years (1971-80)			10-years (1981-90)	
Fish						
DE	102.06	0.51	26.46	99.75	3.20	94.43
SE	0.03	90.75	40.24	0.01	103.46	25.78
IE	-2.09	8.74	33.30	0.24	-6.66	-20.21
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
Palm oil & kernel						
DE	101.78	0.73	31.42	99.62	4.24	113.55
SE	0.01	86.38	31.43	0.01	111.62	25.18
IE	-1.79	12.89	37.15	0.37	-15.86	-38.73
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Notes: [a] Coms = commodities, DE = demand effect, SE = supply effect,

IE = Interaction effect