

SOURCES OF MAJOR AGRICULTURAL EXPORT EARNINGS STABILITY IN INDONESIA

Pantjar Simatupang*)

ABSTRAK

Stabilitas penerimaan ekspor adalah penting untuk mengurangi premi resiko bagi eksportir. Oleh karena itu, stabilitas penerimaan ekspor dapat mempengaruhi volume ekspor, dan selanjutnya tingkat produksi. Stabilitas penerimaan ekspor juga penting bagi pemerintah dalam mengelola cadangan devisa. Stabilitas penerimaan ekspor juga mempengaruhi tingkat nilai tukar. Oleh karena itu, pemahaman akan sumber penyebab ketidakstabilan penerimaan ekspor adalah sangat penting, sehingga dapat diambil kebijakan yang tepat. Dalam penelitian ini dibahas sumber ketidakstabilan penerimaan ekspor dari empat komoditi ekspor utama Indonesia yaitu karet, kopi, kelapa sawit, dan teh dengan mempergunakan sidik ragam. Komoditi yang paling tidak stabil nilai ekspornya adalah karet dan kopi. Sumber utama ketidakstabilan penerimaan dari ekspor karet adalah harga internasional selama periode 1976-1985. Harga internasional merupakan sumber utama ketidakstabilan dari ekspor kopi pada periode 1976-1980. Namun, pada periode 1981-1985 volume eksporlah yang menjadi sumber utama ketidakstabilan. Kelapa sawit dan teh sama seperti ketidakstabilan pada kopi.

ABSTRACT

Export earning stability is important for exporters to reduce risks premium. Hence, it may affect the volume of export and then production. For the government export earning stability is important in managing its foreign exchange reserve. Export earning stability may also affect the prevailing exchange rate. Understanding the causes of export earning instability will be useful in taking appropriate policies for the export earning stabilization. This paper decomposes the export earning sources of instability of four Indonesia major agricultural export commodities: rubber, coffee, palm oil, and tea using variance analysis. The most unstable is rubber export and followed by coffee. The main source of instability for rubber is international price for the 1976-1985 period. Price was the main source of instability for coffee during the 1976-1980 period. But in the 1981-1985 period, quantity is the main source of export earning instability. Palm oil and tea follow the same pattern with coffee.

INTRODUCTION

In addition to source of foreign exchange, which is important for the economy in general, agricultural export is also important for agricultural production and growth affect general economic performance. The role of export on production and growth can be better explained by the export-led growth hypothesis. The hypothesis says that export does not assist growth passively as excess supply containment. Export actively induces production and growth through both supply and demand. The role of export as demand shifter is quite clear. Export is

*) Research staff, Center for Agro Economic Research, Bogor.

part of total demand. A shift in the demand function, however, more likely has once-and-for-all effect only. This initial effect could be followed by the second effect through supply side. A higher demand will form a confident expectation for producers, and they will increase investment accordingly. This investment could also be induced by the higher profit obtained. As investment increase, production will continuously increase. A higher production can be obtained if there is decreasing cost due to larger scale of production. The export, therefore could form a production virtuous circle, caused by the investment acceleration.

The above argument says that the importance of export earning stability is to enhance investment and production of the export commodity. International price and exchange rate are two major sources of export earning instability. Studies have shown that both price and exchange rate stability can affect the volume of export (Feldmand, 1982). We can say, then, that export earning instability may also be important in determining the volume of export itself.

Export earning stability is not only important in a micro level, i.e., producers and exporters of the commodity. In a macro level, export earning stability is also important for the government in managing foreign exchange reserve. The stability of foreign exchange reserve may reflect exchange rate risk (stability). As it is well known, the exchange rate depends on the availability of foreign exchange supply. The government foreign exchange reserve reflects the ability of the government to maintain the supply, enough to support the prevailing exchange rate.

The role of agricultural export is increasingly important for Indonesia as oil export decreased in recent years. It is obvious that, Indonesia's export is heavily dependent on oil. Oil export contributes 82.4 percent to the total export in 1982. Although its share decreased due to price fall, it was still quite high, however. In 1985, the oil export share was reduced to 68.4 percent and this, has caused a serious problem of the balance payment.

The government has clearly realized the potential problem of the heavy dependence on a single commodity export. An immediate and vigorous campaigns to boost non-oil exports have been conducted in order to have a more diversified export earning. A more diversified export earning is needed to reduce its vulnerability to a particular commodity price fall. In other words, it helps in increasing export earning stability. With a large amount of oil revenue obtained during the oil boom, the government launched a massive investment on agricultural export commodities. The main crops are rubber, palm oil, coffee, and tea. These are traditional export commodities for Indonesia.

Unfortunately, the first harvest of the newly planted and rehabilitated crops coincide with the sharp fall in international price since 1981. At the same time, oil

price also falls, which makes total export and government revenue reduce sharply. As the result, investment on agricultural export commodities is also slowed down.

This paper is an attempt to investigate the stability of some Indonesia major agricultural export commodities: rubber, palm oil, coffee, and tea during the 1976-1985 period. The sources of export earning instability are investigated using variance analysis. The sources of the instability changes are also investigated. A similar study conducted by Naya (1979) covered the 1968-1975 period.

METHODOLOGY

Variance has been widely used as a measure of instability. Variance method has some advantages such as: (1) easy to compute, and (2) decomposable into each component. Hence, using variance method, the contribution of international price and quantity instability on export earning instability can be computed. Assuming that export demand has perfectly elastic, the quantity variation can be considered as supply (domestic) source variation, whereas price variation is international source.

There have been many studies on decomposition of export earning stability. Some of them are Kingston (1976), Naya (1973, 1974), Murray (1978), Wong (1981), and Lloyd and Procter (1983).

For simplicity of exposition, suppose that total export earning comes from two commodities:

$$E = E_1 + E_2 \quad (1)$$

The total export earning variance is:

$$\text{Var}(E) = \text{Var}(E_1) + \text{Var}(E_2) + 2 \text{cov}(E_1, E_2) \quad (2)$$

Export earning is export price (P) times quantity (Q), or $E_i = P_i Q_i$. The variance of export earning for each commodity is:

$$\text{Var}(E_i) = \bar{Q}_i^2 \text{Var}(P_i) + \bar{P}_i^2 \text{Var}(Q_i) + I_{ii} \quad (3)$$

where the bar sign denotes the mean. The term I_{ii} represents several terms constitute interaction between P_i and Q_i . I_{ii} can be computed as the residual between the total variance and the sum of the direct component of the price and quantity variation (the first two terms on the right hand side of equation (3)). Combining (2) and (3), the result is:

$$\begin{aligned} \text{Var}(E) = & Q_1^2 \text{Var}(P_1) + P_1^2 \text{Var}(Q) + Q_2^2 \text{Var}(P_2) \\ & + P_2^2 \text{Var}(Q_2) + I_{12} + I_{11} + I_{22} \end{aligned} \quad (4)$$

where $I_{12} = 2 \text{ cov } (E_1, E_2)$. In general, for n commodities, the variance of total export earning can be decomposed into:

$$\begin{aligned} \text{Var } (E) = & \sum_{i=1}^n (Q_i^2 \text{Var } (P_i) + P_i^2 \text{Var } (Q_i) + I_{ii}) \\ & + \frac{1}{2} \sum_i^n \sum_j^n I_{ij}, i = j, ij = ji \end{aligned} \quad (5)$$

$Q_i^2 \text{ var } (P_i)$ = direct contribution of price variability

$P_i^2 \text{ var } (Q_i)$ = direct contribution of quantity variability

I_{ii} = contribution of interaction between price and quantity of the same commodity

I_{ij} = indirect contribution which is interaction between export earnings from two commodities

If the demand function is perfectly elastic (inelastic) and the supply function is perfectly inelastic (elastic), decomposition of instability into price and quantity component is equivalent to decomposition in terms of demand and supply effects (Piggot, 1978). It is quite reasonable to assume that Indonesia's export demand is perfectly elastic. Supply, however, might not be perfectly elastic or inelastic. Nevertheless, if export supply is highly inelastic relative to export demand, it would be reasonable to conclude that the demand fluctuation is the principal cause of export earning instability, when the computation shows that a much greater contribution of price variability compared to quantity variability (Fleming and Piggott, 1985). For Indonesia, the assumption of highly elastic export demand and inelastic export supply is reasonable, since the domestic market is small for the commodities considered. In addition, the government policies are domestic biased that makes export practically exceeds supply disposal.

Since there may be a large change in both magnitude and composition of the export earning instability, it is useful to understand the causes of the change. This can be done using a simple analytical method. From equation (3) we have:

$$\text{Var } E = Q^2 \text{ var } (P) + P^2 \text{ var } (Q) + I$$

By simple derivation, the change in variability ($\Delta \text{Var } E$) can be written as:

$$\begin{aligned} \Delta \text{Var } E = & Q^2 \Delta \text{Var } (P) + \text{Var } P \Delta Q^2 + \Delta \text{Var } (P) \Delta Q^2 + P^2 \Delta \text{Var } (Q) \\ & + \text{Var } (Q) \Delta P^2 + \text{Var } (Q) \Delta P^2 + \Delta I \end{aligned}$$

or

$$\begin{aligned} \Delta \text{Var } E = & Q^2 \Delta \text{Var } (P) + \text{Var } (P) \Delta Q^2 + \text{Var } (P) \Delta P^2 \\ & + \text{Var } (Q) \Delta P^2 + \text{RES} \end{aligned} \quad (6)$$

$$RES = \Delta \text{Var} (P) \Delta Q^2 + \Delta \text{Var} (Q) \Delta P^2 + \Delta I$$

From equation (6), the source of variability change are decomposed into five components:

$Q^2 \Delta \text{Var} (P)$ = direct contribution of price variance

$P^2 \Delta \text{Var} (Q)$ = direct contribution of quantity variance

$\text{Var} (Q) \Delta P^2$ = direct contribution of price level change

$\text{Var} (P) \Delta Q^2$ = direct contribution of quantity level change

RES = contribution of interaction between price and quantity changes

The direct sources of variability change may be also divided into price and quantity contribution. The direct sources may come from the change in the level and the variance of price and quantity. Therefore, the price direct contribution (PDC) is:

$$PDC = Q^2 \Delta \text{Var} (P) + \text{Var} (Q) \Delta P^2 \quad (7)$$

The quantity direct contribution (QDC) can be defined in similar manner. The QDC is

$$QDC = P^2 \Delta \text{Var} (Q) + \text{Var} (P) \Delta Q^2 \quad (8)$$

The study conducted by Naya (1979) only decomposed the export earning instability into its commodity components. He did not further decompose the commodity instability into its price and quantity contributions.

RESULTS AND DISCUSSION

Total planted area of rubber, palm oil, and tea is given in Appendix Table 1. From the table we can see that the planted area increase for all commodities and the plantation land is mainly used for rubber. The area are growing for all commodities. The average growth rates for oil palm and coffee are extremely high, i.e., 8.7 and 8.1 percent, respectively per year. The table also indicate that the growth was started to increase in 1978/1979. This coincides with the massive government investment programs especially through nucleus estate system, and various programs on export commodity promotion.

The commodity production are provided in Appendix Table 2. Following the area growth rate pattern, the highest production growth rate enjoyed by palm oil, followed by coffee, tea, and rubber, with the rate 11.7, 7.3, 5.6, and 2.0 percent, respectively.

The difference between production and area growth rate is productivity growth. The productivity growth rates are 1.1, 3.0, -0.8, and 4.5 percent, respectively for rubber, palm oil, coffee, and tea. This indicates that the increase in

tea production is largely due to the increase in productivity. In contrary, coffee production growth is wholly comes from the increase in area.

The volume of export for the four commodities are listed in Appendix Table 3. This of export is increase steadily from 1976 to 1980. A sudden fall occurred in 1981. Palm oil suffered the most with 61.3 percent fall. The volume of export is then increased started in 1982, except for tea which started in 1983.

Instability Decomposition

Decomposition of export earning by commodity (rubber, palm oil, coffee, and tea) is given in Table 1. This table shows that the total contribution of the direct variance is not significantly different from the total covariance contribution. But overtime, their direction of change is reverse. The direct variance contribution increases from 48.2 percent during the 1976-1980 period to 54.6 percent during the 1981-1985 period. The covariance contribution, on the other hand, decreases from 51.8 percent during the 1976-1980 period to 45.4 percent during the 1981-1985 period. For the four commodities as a whole, total export earning variability fall during the two periods.

Figures on the table can also say that rubber is the main source of the total export earning instability.

Table 1. Commodity decomposition of export earning variability, 1976-1985.

	1976 - 1980	1981 - 1985
I. Direct variance	95 312 (48.2)	35 818 (54.6)
Rubber	68 910 (34.9)	17 520 (26.7)
Coffee	23 915 (12.1)	11 903 (18.1)
Palm Oil	1 871 (0.9)	3 404 (5.2)
Tea	616 (0.3)	2 991 (4.6)
II. Covariance	102 358 (51.8)	29 782 (45.4)
Rubber-Coffee	57 938 (29.3)	12 792 (19.5)
Rubber-Palm Oil	20 262 (10.3)	-6 332 (-9.7)
Rubber-Tea	5 076 (2.6)	9 956 (15.2)
Coffee-Palm Oil	11 212 (5.7)	3 998 (6.1)
Coffee-Tea	6 378 (3.2)	10 434 (15.9)
Palm Oil-Tea	1 492 (0.8)	-1 066 (-1.6)
T o t a l	197 670 (100)	65 600 (100)

() Figure in parenthesis is percentage.

During the 1976-1980 period rubber direct variance contributed 34.9 percent out of 48.2 percent of the total direct variance. Rubber covariations are also very high.

During the 1981-1985 period, rubber contribution to total export earning variation fell, but it was still the highest. Rubber direct contribution during this period was 26.7 percent. Contribution of all other commodities, in contrary, were increased. The highest increase is for tea, followed by palm oil. Clearly, the sharp reduction in total export earning instability is due to rubber stability. The second largest source of the direct instability is coffee. Its variability was 12.1 percent and 18.1 percent in the period of 1976-1980 and 1981-1985, respectively.

Table 2. Price and quantity decomposition of commodity export earning variability.

Commodity	Source	1976 - 1980	1981 - 1985
Rubber	Quantity	3 926 (5.7)	8 080 (46.1)
	Price	40 871 (59.3)	10 829 (61.8)
	Residual	24 113 (35.0)	-1 389 (-7.9)
	Total	68 910 (100)	17 520 (100)
Palm Oil	Quantity	580 (31.0)	5 714 (167.9)
	Price	3 105 (166.8)	2 937 (86.3)
	Residual	-1 814 (-97.0)	-5 247 (-154.1)
	Total	1 871 (100)	3 404 (100)
Coffee	Quantity	14 101 (58.9)	4 028 (33.8)
	Price	15 749 (65.9)	2 713 (22.8)
	Residual	-5 935 (-24.8)	5 162 (43.4)
	Total	23 915 (100)	11 903 (100)
Tea	Quantity	296 (48.1)	3 259 (109.0)
	Price	521 (84.7)	1 392 (46.5)
	Residual	-202 (-32.8)	-1 660 (-55.5)
	Total	615 (100)	2 991 (100)

() Figure in parenthesis is percentage.

Decomposition of export earning instability into price, quantity, and residual components is given in Table 2. The figures show that during the 1976-1981 period, export earning instability is dominated by price instability for all commodities. This price domination is extremely high for rubber and palm oil.

The structure of instability was changed in 1981-1985 period. The share of quantity instability increase sharply. The share of quantity instability is higher than the share of price instability, except for rubber. But for rubber, the quantity share increases from 5.7 percent to 46.1 percent. A sharp change also occurs for the residual component. The magnitude for the residual falls for all commodities, except for coffee.

From Table 2 we can see that the contribution of price to rubber export earning variability in 1976-1980 period reached at 59.3 percent. Direct quantity contribution was only 5.7 percent, whereas residual contribution was 35.0 percent. In the 1981-1985 period, the price contribution was decreased to 61.8 percent, whereas the quantity contribution increased sharply to 46.1 percent and the residual contribution fell sharply from 68 910 in the 1976-1980 to only 17 520 in the 1981-1985 period.

The price contribution to the palm oil export earning in the 1976-1980 period was very high, that was 166.0 percent. Quantity contribution to the earning variability was 31.0 percent and residual contribution was negative. This is an indication that if price falls, the volume of palm oil export will continuously increase. The volume of the palm oil export may not be responsive to international price fall.

During the 1981-1985 period the quantity contribution to the palm oil export earning increased to 167.9 percent. The residual contribution fell even higher to 154.1 percent. Overall, palm oil export earning instability was dominated by the quantity instability during the 1981-1985 period.

Like other commodities, the coffee export earning instability was dominated by price instability during the 1976-1980 period. Price contribution to export earning increased to 167.9 percent. The residual contribution fell even higher contribution were 58.9 and -24.8 percent, respectively. During the 1981-1985 period both quantity and price variations fell but the residual increased. The increase in quantity and price covariation was so high that made it the most dominant cause of the export earning variability. The difference between price and quantity contribution to coffee export earnings variability were not high in both periods compared to other commodities.

During the 1976-1981 the price contribution to tea export earning variability was 84.7 percent, and the quantity and residual contribution were 48.1 and -32.8 percent, respectively. In the 1981-1985 period, both quantity and price contributions were increased sharply, but the residual contribution was decreased sharply. The increase in quantity contribution was so high and it become the most dominant caused by tea export earning variability during the 1981-1985 period. As a whole, tea export earning variability decreased sharply from 615 in the 1976-1980 period to 2991 in the 1981-1985 period.

Sources of Export Earning Instability Change

Decomposition of export earning instability change into price, quantity and their interactions is presented in Table 3. It shows that the main sources the change in rubber export earning stability were price and residual (covariations). The price

contribution was 61.4 percent and the residual contribution was 53.9 percent. Quantity made the export earning more unstable.

Table 3. Sources of export earning variability changes by commodity.

Source	Rubber	Palm Oil	Coffee	Tea	Total
Price	-31 553 (61.4)	3 101 (202.3)	-22 322 (185.8)	297 (20.4)	-50 477 (79.7)
Quantity	7 869 (-15.3)	3 686 (240.4)	6 076 (-50.6)	-7 282 (499.5)	10 349 (-16.3)
Residual	-27 706 (53.9)	-5 254 (-342.7)	4 234 (-35.2)	5 527 (379.1)	-23 199 (36.6)
Total	-51 390 (100)	1 533 (100)	-12 012 (100)	-1 458 (100)	-63 327 (100)

() Figure in parenthesis is percentage.

Unlike other commodities, export earning from palm oil was more unstable. The main cause of the increase in the instability were quantity and price instability. The quantity and price contribution to the increase in instability were 240.4 and 202.3 percent, respectively. Covariation (residual) between price and quantity, on the other hand, stabilized the export earning. The covariance contribution to the earning instability was -342.7 percent.

Coffee export earning was increasingly stable. This was due to price stability. The price contribution to the increase in earning stability was 185.8 percent. Both quantity and covariation increased the earning instability. Their respective contribution were -50.6 and -35.2 percent.

Tea export earning was also more stable. This was mainly due to quantity stability. The quantity contribution to stability was 499.5 percent. Price and covariance increased export earning stability. Their respective contribution to export earning stability were 20.4 and 379.1 percent.

For the four commodities as a whole, the export earning was more stable. This was mainly due to price stability. The price contribution to the increase in the export earning stability was 79.7 percent. Covariation also increased the earning stability. Its contribution was 36.6 percent. Quantity variations, on the other hand, reduced the export earning stability. Its contribution, however, quite low, that was only 16.3 percent. Accordingly, we can conclude that the international price is the main source of the export earning stability.

Decomposition of price contribution to the export earning variability change is presented in Table 4. The table shows that the main contribution to the price component of export earning stability was price variance. This was true for all of

the four commodities. The variance contribution was ranging from 63.3 to 98.9 percent. As a whole, the variance contribution was 83.5 percent. Clearly, this indicates that the main cause of the export earning variation was international price variability.

Table 4. Decomposition of the price contribution to the export earning variability.

Source	Rubber	Palm Oil	Coffee	Tea	Total
Variance	-31 212 (98.9)	2 932 (94.6)	-14 125 (63.3)	253 (85.2)	-42 152 (83.5)
Mean	-341 (1.1)	169 (5.4)	- 8 197 (36.7)	44 (14.8)	- 8 325 (16.5)
Total	-31 553 (100)	3 101 (100)	-22 322 (100)	297 (100)	-50 477 (100)

() Figure in parenthesis is percentage.

Decomposition of quantity contribution to the change in export earning variability is presented in Table 5. The figures show that the main contribution to the quantity source of the change in export earning variability was quantity variance for palm oil and tea. In the case of palm oil, the quantity variance increased the earning variability. The quantity variance contribution was 104.3 percent. In the case of tea, on the other hand, the quantity variance reduced the export earning variability. Its contribution was 108.5 percent.

Table 5. Decomposition of quantity contribution to the export earning variability change.

Source	Rubber	Palm Oil	Coffee	Tea	Total
Variance	3 926 (49.9)	3 845 (104.3)	-4 488 (-73.9)	-7 900 (108.5)	-4 617 (-44.6)
Mean	3 943 (50.1)	-159 (-4.3)	10 564 (173.9)	618 (-8.5)	14 966 (144.6)
Total	7 869 (100)	3 686 (100)	6 076 (100)	-7 282 (100)	10 349 (100)

() Figure in parenthesis is percentage.

For coffee, the main quantity contribution to the change in export earning was the average of export quantity (volume). Its contribution was 173.9 percent. For rubber, the quantity variance and mean contributed almost equally to the change in export earning variability. Their contributions are 49.9 and 50.1 percent, respectively.

As a whole, the main source of the change in quantity contribution to the export earning variability was mixed. In total, the mean contribution was higher than the variance contribution. The net effect of quantity variance reduced the earning variability. In contrary, the quantity mean increased the export earning variability.

CONCLUSION

In this paper the sources of export earning stability from four major agricultural export commodities, i.e., rubber, coffee, palm oil, and tea are decomposed using variance analysis. Decomposition is not only by commodity, but also by price and quantity for each commodity.

The high unstable export commodities are rubber and coffee. They are the largest agricultural export. The rubber and coffee export values, however, were increasingly stable overtime, whereas the palm oil and tea export values were increasingly unstable.

Reduction in rubber export earning variability was mainly due to price stability, more specifically reduction in price variance. This indicates, international price is the main source of rubber export earning instability. Assuming that Indonesia cannot influence international price, it would be difficult for the government to reduce the instability. Perhaps, the more plausible policy is to increase domestic demand. This can be done by increasing rubber processing industries. Another way is to urge the International Natural Rubber Organization (INRO) to work more effectively in stabilizing the rubber price.

In the 1976-1980 period palm oil export earning variability was dominated by price instability, but in the 1981-1985 period it was dominated by quantity instability. The residual contribution to the export earning variability was always high in both periods. Both price and quantity increase the earning variation, but covariance reduces it. The change in the earning variability is dominated by the price and quantity variances. This indicates the evidence of structural change in palm oil export. That is, the main source of export earning instability has changed from price variance to quantity variance. Domestic demand and production variabilities become the major source of palm oil export earning. Since the production increase steadily, the main source of the export earning variability would be more likely domestic demand. Domestic palm oil marketing is controlled by the government through compulsory domestic supply at determined price. In addition, palm oil has an almost perfect substitute, that is coconut or copra. This implies that reducing the palm oil export earning variability must be taken into account the coconut/copra market. Reexamination of domestic compulsory policy may be useful to reduce export earning stability.

Tea export earning variability has the same pattern with the palm oil. During the 1976-1980 period, price variance was the dominant source of the variability, but in the 1981-1985 period, quantity variance was the most.

For coffee, both quantity and price instability were important caused by its export earning variability. In the 1976-1980 period the international price was the most dominant, but quantity was the most dominant in the 1981-1985 period. Decomposition of the change in variability shows that price component was mainly due to price variance but tea quantity component was mainly due to the change in the mean. This indicates that the level of export quantity is the major determinant of coffee export earning variability. This may be due to the high dependence on export quota. Stability of coffee export quota may help reducing export earning variability. The price variability can be reduced if the International Coffee Organization (ICO) could formulate regulation to benefit exporters. The government of Indonesia should urge the ICO to stabilize coffee price in a more effective way and to rearrange a more equitable and stable export quota.

REFERENCES

- Feldman, R. 1982. Dollar appreciation, foreign trade, and the U.S. economy. Federal Reserve Bank of New York Review, Quarterly Review 7: 1-9. (Summer).
- Fleming, E.M. and R.R. Piggott. 1985. Analysis of export earnings instability in South Pacific Region. The Singapore Economic Review 3: 14-33.
- Kingston, J.L. 1976. Export concentration and export performance in developing countries. Journal of Development Studies 12: 311-319.
- Lloyd, P.J. and R.G. Procter. 1983. Commodity decomposition of export instability: New Zealand. Journal of Development Economics 12: 41-57.
- Murray, D. 1978. Export earning instability: price, quantity, supply, demand Economic Development and Cultural Change 27: 61-78.
- Naya, S. 1973. Fluctuations in export earnings and economic patterns of Asian Countries. Economic Development and Cultural Change 21: 640-641.
- Naya, S. 1974. Commodity contribution to Indonesian export instability. Ekonomi Keuangan Indonesia 27: 229-233.
- Naya, S. 1979. Commodity contribution to Indonesian export instability. Ekonomi Keuangan Indonesia 27 (2): 229-235.
- Piggott, R.R. 1978. Decomposition of gross revenue into demand and supply components. Australian Journal of Agricultural Economics 22: 145-157.
- Wong, C.H. 1981. Models of export instability: empirical tests for less-developed countries. Paper presented to a Workshop on Food Trade and Food Security. Australian National University.

Appendix Table 1. Total planted area to rubber, palm oil, coffee, and tea, 1972-1984 (1000 hectares).

Year	Rubber	Palm oil	Coffee	Tea
1972	2347.8	152.1	395.1	104.1
1973	2347.9	157.8	381.2	101.7
1974	2329.1	181.7	368.6	101.5
1975	2320.7	188.8	399.9	100.7
1976	2305.7	211.1	440.0	101.3
1977	2291.0	220.4	497.8	95.4
1978	2312.5	250.5	520.6	102.5
1979	2384.0	260.9	624.1	108.0
1980	2383.8	294.6	707.5	112.7
1981	2440.1	319.0	796.8	106.6
1982	2483.9	329.9	873.0	111.4
1983	2578.0	405.6	813.0	111.7
1984*)	2608.6	439.6	830.0	116.6
Growth (%)	0.9	8.7	8.1	1.1

*) Preliminary data.

Source: Directorate General of Estate Crops.

Appendix Table 2. Rubber, palm oil, coffee, and tea production, 1972-1984 (1000 t).

Year	Rubber	Palm oil	Coffee	Tea
1972	800.1	269.5	178.7	59.9
1973	844.3	289.7	150.2	67.5
1974	816.5	347.7	149.8	65.0
1975	784.8	397.3	170.4	70.1
1976	856.5	431.0	193.4	73.8
1977	854.0	502.0	194.0	82.9
1978	885.0	456.9	222.7	92.1
1979	963.9	641.4	273.7	97.2
1980	1020.0	721.2	295.0	106.2
1981	963.2	796.2	314.9	109.8
1982	899.2	884.1	335.4	92.7
1983	1007.0	983.0	305.6	110.3
1984*)	1012.0	1044.0	315.4	118.7
Growth (%)	2.0	11.7	7.3	5.6

*) Preliminary data.

Source: Directorate General of Estate Crops.

Appendix Table 3. Export volume of rubber, coffee, palm oil, and tea, 1976-1985 (1000 t).

Year	Rubber	Coffee	Palm Oil	Tea
1976	811.5	136.4	405.6	47.5
1977	800.2	160.4	404.6	51.3
1978	861.5	215.8	412.1	56.2
1979	861.0	220.2	351.3	53.6
1980	976.1	238.9	502.9	74.2
1981	808.7	210.6	194.6	71.3
1982	797.6	227.0	259.5	63.6
1983	938.0	241.2	345.8	68.6
1984	1009.6	294.5	127.9	85.6
1985	1009.6	282.7	518.8	90.1

Source: Central Bureau of Statistics.