



University of New England

**Graduate School of Agricultural and Resource Economics
&
School of Economics**

**Export Performance in South Pacific Countries
Comparatively Well Endowed with Natural Resources:
Solomon Islands and Vanuatu, 1960 to 1999**

by

Euan Fleming and Anita Blowes

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Export Performance in South Pacific Countries Comparatively Well Endowed with Natural Resources: Solomon Islands and Vanuatu, 1960 to 1999

Euan Fleming and Anita Blowes**

Abstract

Stochastic dominance analysis was used to assess export performance in two Melanesian countries of similar size and structure that are comparatively well endowed with natural resources: Solomon Islands and Vanuatu. Total export values increased over the study period in Solomon Islands, brought about by a significant increase in the value of non-agricultural resource exports. Agricultural exports showed small increases but the average annual rate of growth was only 1.3 per cent for agricultural export values compared with 10.7 per cent in non-agricultural export values.

The record of commodity export performance in Vanuatu over the study period was less impressive, with a small average annual decline in total export values. This decline was caused by agricultural export values falling by 1.5 per cent per annum although it showed signs of abating in the final decade of the study period.

Results suggest that both countries are capable of achieving sustainable economic development, given their generous natural resource endowments, but many factors may militate against this achievement, as witnessed by the current political unrest and crisis in public finance in Solomon Islands.

Key words: export performance; stochastic dominance; Solomon Islands; Vanuatu.

** Euan Fleming is an Associate Professor in the School of Economics and in the Graduate School of Agricultural and Resource Economics at the University of New England. Anita Blowes is an Honours Graduate of the School of Economics at the University of New England.

Contact information: School of Economics, University of New England, Armidale, NSW 2351, Australia. Email: efleming@pobox.une.edu.au.

Export Performance in South Pacific Countries Comparatively Well Endowed with Natural Resources: Solomon Islands and Vanuatu, 1960 to 1999

1. Overview of Analysis

Solomon Islands and Vanuatu are two developing South Pacific island countries that are comparatively well endowed with natural resources (Mellor 1997), and agricultural resources in particular. The question that we attempt to answer in this study is whether these countries were successful in improving commodity export performance over the final four decades of the twentieth century.

Stochastic dominance analysis was used to assess export performance across the four decades, which allowed a simultaneous assessment using two key criteria: the mean value of commodity exports and variability around the mean. Two analytical procedures were followed in its application. First, cumulative distribution functions were calculated and graphed for comparison between decades. This approach was useful where first-degree stochastic dominance or clear second-degree stochastic dominance prevailed. Second, the more advanced analytical procedure of stochastic dominance with respect to a function (Hardaker, Huirne and Anderson 1997, pp. 149-150) was used where stochastic dominance was not clear from a pictorial presentation.

The RISKROOT program devised by McCarl (1996a, 1996b) suited this purpose. RISKROOT was applied to two sets of data: the raw export values and trend-corrected export values within each decade. The latter approach assumes that participants in the export sector are only averse to variability around the trend in values whereas the former approach assumes they are averse to all variability. Results are reported for the approach using the raw export values, as the sets of results differ only in the extent of dominance, and then only in a couple of instances.

Measures of absolute risk aversion were estimated assuming participants in the export sector have a normal relative risk-aversion coefficient of unity. This coefficient was divided by an estimate of the wealth of the participants to derive the absolute risk aversion coefficient that could then be compared with the break-even risk aversion coefficient (BRAC) estimated in the RISKROOT program. Because the risk-aversion coefficients are estimated by a crude approximation, we decided to adopt a conservative approach and include a buffer zone 100 per cent each side of the estimates of the coefficients. If the BRAC were to fall within this zone, the values

were considered too close to each other to make an informed assessment of which decade is superior in export performance. No estimate fell within this buffer zone.

It would have been useful to take the further step of decomposing export values into their price and quantity components. Unfortunately, while such decomposition would have been possible for some exports, it is not for a considerable proportion of export commodities in either country for the full study period.

The data used are values of total domestic commodity exports, and disaggregated values of agricultural and non-agricultural exports. To enable comparisons between the two countries, all series were converted into US dollars using the pertinent annual average exchange rate. The series are expressed in real terms in 1999 prices, using the world export unit value index published by the International Monetary Fund (IMF) (2002) as a deflator. All export values are expressed in 1999 US dollars, including values taken from reference sources other than those published by national statistics departments and central banks that were published in nominal local currency terms.

Agricultural exports are taken to include raw and processed agricultural products because it proved impossible to separate the value added by processors from that by agricultural producers of the raw material outputs. Gross export values were used instead of net value added. The latter series would have given a better picture of changes in export profitability but could not be used because cost data were almost universally unavailable.

Data were confined to annual observations because more time-disaggregated data were not available for the full study period. Quarterly data were available from 1970, and analyses undertaken on these data were helpful in confirming the results obtained using the annual data. The data sources used are Statistics Office (1982), CBSI (2001), Vanuatu Statistics Office (1992), NCDS (1995), Central Bank of Vanuatu (2000) and IMF (2002).

2. Analysis of Commodity Export Performance: Solomon Islands

Trends in export values in Solomon Islands over the whole study period are presented in Table 1. Results of the stochastic dominance analysis for total exports in Solomon Islands are presented in graphical form in Figure 1 and for RISKROOT analysis in Appendix 1. Comparable results for agricultural exports are presented in Figure 2 and Appendix 2, and for non-agricultural exports in Figure 3 and Appendix 3.

Table 1

Linear Trends in Total, Agricultural and Non-Agricultural Export Values in Solomon Islands and Vanuatu, 1960 to 1999

Country	Trend coefficients in values (<i>t</i> -ratios) and annual percentage changes					
	Total exports		Agricultural exports		Non-agricultural exports	
	US\$000	%	US\$000	%	US\$000	%
Solomon Islands	3028.3 (14.05)	5.5	279.3 (2.79)	1.3	2749.0 (16.14)	10.7
Vanuatu	-244.1 (-2.11)	-1.1	-247.5 (-2.32)	-1.5	3.4 (0.13)	0.7

2.1 Overall trend

Solomon Islands was successful in significantly increasing the values of agricultural and non-agricultural exports over the study period, at less than 1 per cent significance level in both cases. The composition of increased annual total export values of US\$3 million was similar to that in Papua New Guinea, with around 90 per cent contributed by non-agricultural exports, but with fishing and timber industries the dominant forces rather than mineral and energy exports. The average annual rate of growth in non-agricultural export values was 10.7 per cent, the highest among all countries under study, compared with only 1.3 per cent for agricultural export values.

The 1970s quite strongly dominated the 1960s for the value of total exports, an outcome brought about by expansion of exports from the non-agricultural resource industries of forestry and fisheries. Only a very small contribution to this dominance

of the 1970s was made by agriculture given that the 1970s had marginal stochastic dominance over the 1960s for agricultural export values, with an estimated risk-aversion coefficient of 0.006 lower than the BRAC of 0.046 reported in Appendix 2. The mean value of annual agricultural exports rose marginally, but was partially offset by a higher coefficient of variation.

These trends continued in the 1980s and 1990s, following the attainment of independence in 1978. The value of total exports increased by almost two-thirds and the coefficient of variation declined in the 1980s. Again, though, there was little contribution from the value of agricultural exports. An increase in the mean value of total exports of about one-half meant that the 1990s dominated the 1980s despite an increase in the coefficient of variation. Mean agricultural and non-agricultural export values in the 1990s were both stochastically dominant over their counterparts in the 1980s in the second degree.

2.2 Agricultural exports

2.2.1 1960s and 1970s

The traditional export of copra was dominant in the early post-war period and, at a value of US\$15.7 million, still accounted for one-half of the value of total exports in 1970. This contribution was nevertheless much less in relative terms than at the dawn of the study period. Copra's share of agricultural and total exports was further diluted during the 1970s consequent to the development of palm oil and cocoa exports in the agricultural sector, and fish and timber exports. On the surface, it appears to be a testimony to the successful diversification of the export base during this decade that copra exports grew to US\$22.6 million by 1979, their second highest level after 1974. In fact, despite the strong finish to the 1970s, average annual copra export values declined slightly between decades from US\$16.5 million to US\$14.8 million. Export values below US\$11 million in 1972-73 and 1975-76, a result of short periods of low world copra prices and the export supply response to these low prices, were the reasons for low values in these four years. As might be expected given the volatility of copra export values in the 1970s, the coefficient of variation rose sharply to 0.40 from 0.12 in the 1960s.

The cocoa industry, also a traditional one, was in a somnolent state by the 1960s with the mean annual export value only US\$101 k. Unsuitable varieties of *Trinitario* cocoa were showing susceptibility to pests and diseases and causing problems in fermentation. Other problems included inappropriate planting, costly marketing and the production of cocoa beans of poor quality (World Bank 1980:23, Chase 1986). Private development initiatives helped revive the industry in the 1970s, especially in North-West Malaita, supported by field officers in the Ministry of Agriculture and

Lands. Interest in cocoa production by both estates and smallholders was renewed and cocoa exports expanded in due course. Export values increased from US\$0.19 million in 1970 to the still modest level of US\$0.91 million by the end of the decade. The mean annual export value in the 1970s was more than treble that in the 1960s, at US\$0.36 million.

A significant contribution from palm oil exports, which commenced in 1976, supplemented gains in the value of cocoa exports during the 1970s. The oil palm industry began as a joint venture between the Solomon Islands government, Commonwealth Development Corporation and landholders to form Solomon Islands Plantations Ltd in 1971 (Ernst and Young 1991:18). Planting began in response to successful trials between 1965 and 1970 (World Bank 1980:23). The industry rapidly assumed a position as a major export industry through palm oil and palm kernel oil exports. These exports had reached a combined value of US\$10.1 million by 1979, only three years after exporting had begun. But the major threats of cyclones and floods, and limited world market prospects for palm oil, were sorely to test the industry in the coming years.

Mechanised irrigated rice grown on the Guadalcanal Plains was one of the most unlikely agricultural export industries in the South Pacific. Rice became an export crop of some note in Solomon Islands in the second half of the 1970s and early 1980s even though the country experienced a comparative disadvantage in rice production (Gibson 1995). This phenomenon was a result of a misguided government food import-substitution policy that led to production levels beyond domestic rice needs. The main impetus to rice export occurred in 1974 with the establishment of a joint venture between Brewers Solomon Associates Ltd and the Solomon Islands government. Harvested area increased from 599 hectares in 1975 to 2512 hectares in 1978 (World Bank 1980:23), causing such a rapid increase in rice output that rice exports were valued at US\$1.34 million by the end of the decade.

2.2.2 1980s

The value of agricultural exports contributed little to the substantial increase in the value of total exports in the 1980s. However, the 1980s stochastically dominated the 1970s (slightly, in second-degree dominance), due mainly to further development of the oil palm and cocoa industries.

The dramatic decline in relative contribution to the value of exports by copra during the 1970s continued during the 1980s. Copra contributed less than 20 per cent of total exports in the early 1980s; by the late 1980s, this proportion had dropped below 10 per cent. Like the 1970s, the value of copra exports declined in absolute terms during the 1980s but it fell much more, from US\$22.6 million in 1979 to US\$8.4 million in 1989. Even lower values were experienced during the decade, the lowest being

US\$3.7 million in 1986, brought on by the damage caused by Cyclone Namu in May 1986 and low world copra prices in 1985-86 (World Bank 1991:205).

The cocoa industry developed well in the 1980s, largely based on private sector initiatives (PDP Australia 1991:24). The crop had become increasingly popular among smallholders (Jones, Fleming and Hardaker 1988:55). The average annual cocoa export value for the 1980s increased to US\$2.71 million, six times higher than the average annual value of US\$0.45 million in the 1970s. The cocoa export value expanded quite substantially until 1987, largely as a result of the impact of the world commodity boom of the early to mid 1980s. It peaked at US\$4.49 million in 1987 compared with US\$1.02 million in 1982. Luckily, Cyclone Namu did not affect the industry as badly as it did the copra and palm oil industries. A depressed world cocoa market in the late 1980s saw the export value fall back to US\$3.18 million in 1989.

Palm oil and kernel export revenues averaged US\$8.27 million per year in the 1980s. The annual value declined slowly in the first four years of the decade despite an upward trend in export volumes, drifting to US\$8.69 million in 1983 in the face of lower world palm oil prices. Export volumes continued to expand into 1984, when a doubling of world prices lifted the export value quite steeply to US\$15.74 million. Cyclone Namu devastated the industry in 1986, setting back its progress for some years. The adverse effect on export value was initially spectacular, with only US\$3.71 million of palm oil and kernel exported in that year, less than one-quarter the 1984 value. But the industry recovered sufficiently to post export values of US\$6.24 million in 1988 and US\$8.06 million in the last year of the decade. Despite falling world palm oil prices beyond 1985, the export volume of palm oil recovered from 11.6 kt in 1987 to 14.2 kt in 1989. This increase partly reflected the post-cyclone recovery phase but was probably also caused to some extent by a major devaluation of the Solomon Islands dollar that encouraged export supply. In 1983, SI\$1 was worth US\$0.82; by 1989, its value had declined to US\$0.42.

Rice exports peaked at US\$1.86 million in 1980, creating the odd spectacle of rice becoming the fifth most valuable export, and the third most valuable agricultural export after copra and palm oil. The industry had failed by 1985 as a result of lack of profitability, intractable pest problems and difficulties in maintaining machinery in good working order (Abeyasinghe 1981). But it took Cyclone Namu in 1986 to bring rice production and export to an end (World Bank 1993:61).

2.2.3 1990s

As for the test for stochastic dominance between the 1970s and 1980s, there was little to choose in stochastic dominance between the 1980s and the 1990s for agricultural exports although again the later decade was slightly dominant. By 1992, the combined values of copra and coconut oil exports had shrunk to around 8 per cent of the value

of total exports and one-third of the value of agricultural exports. Despite its now minor relative importance, the coconut industry in Solomon Islands went against the recent trend of substantially declining export values of coconut products by successfully introducing coconut oil milling. This success by South Pacific standards was also due in part to the replanting of smallholder coconut palms in the first half of the 1980s (Fairbairn 1985:73-74) that boosted copra output in the 1990s.

A coconut oil mill constructed in the late 1980s was operated by the Land Use Division within MAL for a joint venture company of Lever Solomons Ltd and Land-Purchases Coops (Ilala 1989). The factory milled copra from the plantations of both Lever Solomons Ltd and smallholders (Ilala 1989:26). Exports of coconut oil began in earnest in 1990, valued at US\$0.8 million. The export value had doubled to US\$1.6 million by 1992, but this was still a small change compared with an increase in copra exports from US\$3.6 million to US\$6.0 million over the same two-year period. The government-owned Commodities Export Marketing Authority purchased Lever Solomons Ltd in 1996 and established a subsidiary, Russell Islands Plantation Estates Ltd, investing in new equipment for the coconut oil mill (ADB 1998:86). It also established a number of small mills in joint ventures with provincial governments (ADB 1998:87). By 1999, 10.35 kt of coconut oil was produced compared with 23.24 kt of copra, the highest proportion since milling began.

The cocoa industry continued to perform well, with the average annual cocoa export value for the 1990s of US\$4.72 million 74 per cent higher than the average for the 1980s. Depressed world market conditions for cocoa in the early 1990s did not have the expected adverse effect on export values because volumes continued to rise sharply until 1991-92 as the positive impact of new plantings in the previous decade was felt. Consequently, the export value increased from US\$3.21 million in 1989 to US\$4.57 million in 1993, but an abrupt fall in export volume took the value much lower in 1994. Increases in export prices and volumes in 1997 and 1998 lifted export revenue again, with an all-time-high export value of US\$9.76 million achieved in 1997. This renaissance was short-lived as lower world cocoa price and export volume reduced the value of cocoa exports to US\$5.04 million in 1999, but this value was nonetheless above the decade average. One worrying trend was that cocoa output declined around a fluctuating trend from a peak of 4615 tonnes in 1991 to 2395 tonnes in 1999.

It is a sad task to review the performance of palm oil and kernel exports in the 1990s, paradoxically because they were so impressive. Palm oil export revenues averaged US\$11.75 million in the 1990s, up 42 per cent on the annual average export value in the 1980s. Unfortunately, exports were to cease in June 1999 as the plantation belonging to Solomon Islands Plantations Ltd was abandoned because of the civil strife (CBSI 2001:28). The recovery from Cyclone Namu had continued apace in 1990, with the export volume of palm oil increasing from 14.2 kt in 1989 to 23.7 kt in

1990. Yet the export value declined slightly because of low world prices, with unit export values almost halving between 1989 and 1990 (World Bank 1993:51). Low world palm oil prices continued to offset an upward trend in the export volume of palm oil, which, having almost doubled from 1989 to 1990, increased by another 30 per cent to 31.0 kt in 1993. Export volume had been encouraged by further devaluation of the Solomon Islands dollar keeping domestic prices at reasonably profitable levels. It was to remain at a little under the 1993 level until 1998. The export unit value of palm oil began to recover in 1992, increasing by 40 per cent in that year. Further increases in world palm oil prices from 1993 to 1998 raised export values, which reached their highest level at US\$20.74 million in 1998. Despite a fall in the world palm oil price and the mid-year cessation of activities in 1999, the export value in the final year was still US\$13.46 million because the world price had remained reasonably firm in the first few months of the year.

2.3 Non-agricultural exports

The substantial improvements in non-agricultural export performance throughout the study period (first-degree dominance by successive decades except for the 1990s, which dominated the 1980s in the second degree) suggest that Solomon Islands has been successful in diversifying its economy. However, this diversification has been confined to a small number of industries—logging, fisheries and gold mining—that are largely enclave and either extractive or quasi-extractive under current production processes.

2.3.1 1960s and 1970s

Non-agricultural resource development outside the timber industry was negligible during the 1960s, and only log exports were of any significant value in 1970, at US\$12.3 million. The average value of all forestry products of US\$3.15 million in the 1960s disguised a rapid export growth of close to US\$1 per annum over the decade. Commercial logging activities began on a large scale in 1966, encouraged by the substantial exploitable timber resources on some 200 kha to 250 kha (Ministry of Economic Planning 1985:115). Until that year, the value of log exports had been minor.

Timber exports diversified and increased annually in value by US\$0.5 million during the 1970s through the operation of around 40 registered sawmills and 10 foreign-owned logging companies (Ministry of Economic Planning 1985:116). Annual mean export value for the decade was US\$13.29 million, more than four times the mean value in the 1960s. Total export value in 1979 had reached an impressive US\$22.3 million thanks largely to an increase in export price per cubic metre of unsawn timber

from US\$46.38 in 1988 to a decade-high price of US\$80.27 in 1979. The 1979 export value comprised US\$20.7 million in logs and US\$1.6 million in sawn timber.

The World Bank (1995:84) reported that 25.63 kha of forest plantations had been established by 1993. Concerns were already being expressed about the unsustainability of the timber export industry because the rate of log extraction was much higher than the rate of forest replacement. The government had begun reforesting areas from 1967, and one major step in the right direction was the implementation of a joint venture between the government and Commonwealth Development Corporation in 1974 with an extensive replanting program of 8000 hectares of exotic fast-growing hardwood species on the island of Kolombangara, Western Province. Levers Pacific Timbers had heavily logged this area from 1969 to 1978 (Davis and Abbott 1989:20-22).

The 1970s witnessed the emergence of a major fish export industry that was rivalling the copra and timber export industries for supremacy by 1979. Of a total fish export value of US\$23.8 million in that year, the bulk of exports came from fresh and frozen fish (US\$20.5 million), followed by canned fish (US\$2.7 million) and smoked fish (US\$0.6 million). The mean annual value of all fish exports in the 1970s was US\$10.91 million. Development of the industry was not aided by a decrease in the export prices of fresh and frozen fish in the first half of the decade, from US\$1259/tonne in 1971 to US\$813/tonne in 1975. The price then picked up to US\$1152/tonne in 1977 but fell below US\$900/tonne in the final two years of the decade.

The two companies operating in the industrial fisheries sector responsible for these exports, Solomon Taiyo Ltd and National Fisheries Development (NFD), were both established as joint ventures involving the national government and concentrated on fishing for skipjack tuna (Ministry of Economic Planning 1985:123). Solomon Taiyo Ltd, a joint venture between the government and Maruha Corporation of Japan, commenced operating in 1973. NFD was established in 1977. Both companies used pole-and-line vessels (Aqorau 2001:121).

Marine shells were a minor export in the 1960s, averaging US\$0.33 million per annum. By 1970, they were valued at US\$0.55 million. Their value oscillated around low levels during the 1970s, averaging a little higher value than in the 1960s at US\$0.37 million and ending at the decade average in 1979.

Exports in the 1960s from the mining of alluvial gold at the Gold Ridge mine on Guadalcanal were at very low levels. Their annual average export value was US\$49 k. They increased from these negligible values at the beginning of the 1970s to US\$0.24 million by its end, averaging US\$0.14 million for the decade.

2.3.2 1980s

The value of timber exports declined slightly over the 1980s, from US\$22.3 million in 1979 to US\$16.6 million in 1989. No diversification was evident, with log exports remaining overwhelmingly dominant at US\$15.6 million and processed timber only a minor export at US\$1.0 million in 1989. Values were weaker in the second half of the decade in the wake of Lever Pacific closing down its forestry operations due to land access problems (World Bank 1991:205), the after-effects of Cyclone Namu and lower log prices in 1985-86 (World Bank 1991:235). Anxieties continued unabated about a lack of industry sustainability and the unwillingness or inability of the government to take the necessary remedial steps. CSIRO (1987) estimated an industry life of only 36 years if logging continued at the 1986 rate.

Fish exports had established clear supremacy over timber and copra by the end of the 1980s as the domestic fishing fleet was strengthened during the decade. Solomon Taiyo Ltd introduced a group seiner in 1980 and NFC, which was bought by a Canadian firm, BC Packers, in 1989, introduced two individual seiners in 1988 (Aqorau 2001:121). The mean annual export value of all fish exports for the 1980s was US\$19.6 million, almost double the mean annual export value in the 1970s. Most of this difference was due to low export values until 1976 in the previous decade. In fact, the total fish export value in 1989 of US\$26.2 million was not a lot higher than the 1979 figure of US\$23.8 million. Even though export volume continued to increase in the 1980s, there was an overall decrease in export price. World fish prices declined slightly from 1983 to 1986, rose until 1988 (Dorrance, Liu and Woldekidan 1988:15), then fell in 1989 (Dorrance, Liu and Woldekidan 1989:10). Most exports continued to be in the form of fresh and frozen fish, virtually unchanged in value over the decade at US\$20.8 million in 1989. Canned and smoked fish export values increased moderately over the decade, contributing US\$3.6 million and US\$1.9 million, respectively, in 1989.

Gold exports continued at low levels although they did increase in value, reaching US\$1.4 million in 1986, before declining over the remainder of the decade to only US\$0.44 million by 1989. This was to be the calm before the storm.

Marine shell export values increased substantially in the second half of the decade, from US\$0.70 million in 1985 to US\$2.21 million by 1989. The increase in value was due entirely to a rise in the unit export value as the export volume had altered little.

2.3.3 1990s

A rapid increase in log exports in the early 1990s re-established timber as the premier export industry. By 1993, timber exports were valued at US\$62.6 million and they peaked in 1996 at US\$79.0 million. Although values declined slightly over the rest of

the decade, the export value of US\$51.9 million in 1999 contributed 35 per cent of total exports (CBSI 2001:88, Hunt 2001b:2).

There was a continuation of warnings, begun in the 1980s, about the continuing lack of sustainability of the timber industry. Such a dire situation is becoming closer to reality, despite a levelling off in log production between 1997 and 2000 (CBSI 2001:98). Montgomery (1995:75) estimated that commercial forest resources could be depleted by 2010 at the prevailing logging rate, and that communal land owners had 'virtually given away their birthright and a large part of their future prosperity for very little money'. Dauvergne (1998) also reported on the rapid increase in logging operations of multinational corporations in Solomon Islands, noting that they would deplete commercial forest resources in about 13 years were they continue to work at the pace of the mid-1990s. ADB (1998:66-67) assessed the 1997 level of harvesting of logs at two to three times the available sustainable yield from the remaining natural forest. Unless more sustainable production methods are developed in the timber industry, there is a risk that the deceptively successful export performance would be quickly reversed in the future as resources peter out. Tuhonuku (1995:68-69) and Kabutaulaka (1997:18-19) criticised the government for not taking enough action to ensure sustainable yields in the forestry sector. Montgomery (1995:76) explained that the forest resources could be sustainably managed with the correct policies and management procedures in place but, even if policies were adequate, the 'divergences between policy and reality' at the provincial level would have to be eliminated.

The World Bank (1991:208) observed that the fish catch at the beginning of the decade was well below its sustainable limit, and expected the fishing industry to continue its strong growth into the 1990s. However, fish exports failed to expand in the early 1990s, being US\$25.9 million in 1993 compared with US\$26.2 million in 1989, suggesting that this expected growth might not occur. Adverse climatic conditions and problems in NFD (Falvey 1991:9) brought about a drop in fish catch of 22 per cent in 1990. Tuna prices continued their declining trend until they improved in mid-1991 (Dorrance and Liu 1991:50). Offsetting this positive price effect, Aqorau (2001:122) reported that troubles surfaced in 1991 as some provincial governments entered into joint ventures with foreign fishing companies, and the total fish catch fell again in 1992 after a recovery in 1991. The most notable change during this period was in the mix of exports, with a rapid rise in the proportion of canned fish (from 14 per cent in 1989 to 56 per cent in 1993) at the expense of frozen fish (from 79 per cent to 38 per cent). This change was brought about by the commencement of operations of a fish cannery in 1989, operated by Solomon Taiyo Ltd at Noro in Western Province (World Bank 1991:207, Aqorau 2001:121) and employing mainly female labour (Ironmonger and Hill 1998:25).

Some fish export growth did eventually occur in the second half of the decade when production increased by 20 per cent, notably as a result of the entry of a third

company, Solgreen Ltd, into the industry in 1994. A private joint venture, Solgreen Ltd, chartered mainly locally based foreign vessels using longline fishing methods to catch yellowfin tuna for the sashimi market in Japan (Aqorau 2001:121). Export volume expanded from 1993 until 1997 when fish exports were second in importance at US\$32.6 million, or 26 per cent of total exports. Total fish export values averaged US\$21.6 million for the decade, up 10 per cent on the mean value of exports in the 1980s. At this stage, Solomon Taiyo Ltd was operating 21 fishing vessels (ADB 1998:84).

At first glance, it seems odd that Aqorau (2001:124) should describe the period from 1992 to 1997 as one of disintegration. But the impressive record of growth over the study period masks the emergence of major problems for the industrial fisheries sector during the 1990s. Aqorau (2001:122) reported that it was clear that poor management and unsustainable catch levels had emerged. Concern about unsustainable catch levels led to the implementation of the Fisheries Act 1998 (Aqorau 2001:122), and a number of licences were withdrawn from operators not following guidelines (Temu, Hunt and Chandra 1995:12). In addition, the ethnic disturbances that had erupted late in the 1990s between people from Malaita and Guadalcanal caused Solomon Taiyo Ltd to close its operations in August 2000 although, as with PAFCO in Fiji, its canning operations were already facing difficulties (Hunt 2001a:10-11). Exports finished the study period at US\$2.3 million, well down on values in previous years.

Inshore exports of trochus, blacklip and demersal species were quite substantial during the 1990s, averaging US\$2.8 million. As for marine fish exports, however, they had fallen away to low values by 2000 due to the ethnic tensions (Aqorau 2001:121). Marine shell exports began the decade on a positive note, valued at US\$2.08 million in 1990, slightly down on the 1989 value due to a fall-off in export volume. They then fell away sharply, to be valued at US\$0.28 million by 1994 as export volume diminished, but rose to US\$1.24 million in 1995 as export volume recovered, having more than trebled. The unit export value also increased by almost one-third, to a level around one-quarter higher than the unit export value in 1989.

The gold industry had continued to struggle early in the decade, with exports falling to US\$0.26 million by 1993, before the impact of a major project took hold. Mining operations re-commenced on a much larger scale at the Gold Ridge mine following an agreement between an Australian company, Ross Mining Ltd, the government and the Gold Ridge Landowners Association in 1997 (Kabutaulaka 1997:17-18). So quickly did the gold mining industry expand that exports rose to US\$38.8 million, or about one-quarter of total exports, in 1999. Unfortunately, the mine was closed down in 2000 due to the ethnic unrest. The mine has an estimated lifetime of a decade, but Ross Mining Ltd believes that the potential is considerable for the discovery of new deposits nearby (ADB 1998:102).

3. Analysis of Commodity Export Performance: Vanuatu

Trends in export values in Vanuatu over the whole study period are presented in Table 1. Results of the stochastic dominance analysis for total exports are presented in graphical form in Figure 4 and for RISKROOT analysis in Appendix 4. Comparable results for agricultural exports are presented in Figure 5 and Appendix 5, and for non-agricultural exports in Figure 6 and Appendix 6.

3.1 Overall trend

The record of commodity export performance in Vanuatu over the study period was not very impressive, with a significant (at 4 per cent significance level) average annual decline in total export values of US\$244 k, or 1.1 per cent. This decline was caused by agricultural export values falling by 1.5 per cent per annum (significant at 3 per cent significance level). A very small positive coefficient on the non-agricultural exports trend variable was highly insignificant, revealing the difficulties that the country has had to negotiate in developing non-agricultural commodity exports.

Some success was achieved in the 1970s in that the mean annual value of total exports increased slightly, with a moderate increase also in the coefficient of variation. The net result was a marginal stochastic dominance of the 1970s over the 1960s. The BRAC in Appendix 4 for total exports is 0.014, below which the 1970s were dominant, and the estimated risk-aversion coefficient is 0.003. For agricultural exports, the BRAC in Appendix 5 is 0.03, below which the 1970s were dominant, and the estimated risk-aversion coefficient is 0.004.

Independence in 1980 failed to usher in a new era of export expansion. Export performance deteriorated in the 1980s, with the 1960s stochastically dominant for agricultural, non-agricultural and total exports in the second degree and the 1970s dominant in the first degree in all three series. Declines in performance were due entirely to decreases in mean annual values because coefficients of variation were largely unchanged.

The 1990s dawned and proceeded amid growing political instability (Ambrose and Siwatibau 1997:3-8), but it is difficult to discern the impact of this instability on economic performance. For the value of total exports, the 1990s stochastically dominated the 1980s (except for preference for instability) but not the 1960s or 1970s. The improvement over the 1980s was due to the stochastic dominance in non-agricultural exports of the 1990s over all previous decades. This was after the 1960s had stochastically dominated the 1970s (but not in the first or second degree) and 1980s (in the second degree), and the 1970s had dominated the 1980s (in the first degree).

The outcome in the final decade for the value of agricultural exports was a 'line-ball' decision in favour of the 1990s over the 1980s: a slight decrease in the mean value was offset by a decline in the coefficient of variation. However, the 1990s were stochastically dominated by the 1960s and 1970s.

3.2 Agricultural exports

3.2.1 1960s and 1970s

Vanuatu has good edaphic conditions for agricultural production that provide a sound base for agricultural development. This favourable natural environment seemed to have been exploited in the first two decades of the study period as the 1970s enjoyed a slight stochastic dominance over the 1960s for agricultural exports. The agricultural export value increased by an average of 1.4 per cent per annum from 1960 to 1979, despite the occurrence of three cyclones in 1972, severely affecting copra production, and a prolonged dry season in 1978 (McGregor and McGregor 1999:49, 54). This result was due to advances in the export of cocoa and beef. As in most other South Pacific countries, copra was the mainstay of the export sector in Vanuatu in the 1960s and 1970s. But the annual average value of copra exports in the 1970s (US\$18.9 million) was lower than in the 1960s (US\$21.4 million), and the coefficient of variation had increased substantially between decades from 0.21 to 0.50. The relative decline of the copra industry as an export earner was not as precipitous as in most other countries under study. Copra was still contributing three-quarters of total domestic exports and 85 per cent of agricultural exports in 1979.

Cocoa exports increased substantially in value during the 1960s and 1970s, stimulated mainly by smallholder expansion. In contrast, estate production was stagnant because a high proportion of its cocoa trees were old (NPSO 1983). Cocoa exports reached US\$2.5 million in value in 1968 before falling back to US\$0.5 million in 1972. The mid-decade world commodity boom boosted export values to a high of US\$3.8 million in 1978, followed by a steep decline to US\$1.7 million in 1979 as world prices fell back and the effects were felt of the prolonged dry season in 1978 (McGregor and McGregor 1999:7).

Another traditional agricultural industry, the coffee industry, had struggled from well before the study period until the 1970s by which time most plantings had become senescent or senile. Plantations had fallen into a state of disrepair as other activities had become more attractive to producers. The value of exports oscillated between US\$0.2 million and US\$0.5 million during the 1960s before falling away during the 1970s, reaching only US\$0.3 million even at the height of the world coffee boom in 1977.

Vanuatu has had more success than any other South Pacific country in exporting livestock products—predominantly beef but also hides. The beef industry was oriented to satisfying the domestic market until 1958 (Weightman 1989:278). Its export sector developed from humble beginnings as an export niche exploiting links with French territories in the early 1960s. A rapid expansion of cattle numbers on smallholdings, and to a lesser extent estates, in the 1960s and 1970s and new market prospects provided the impetus to expand exports (Weightman 1989:273). The possibility to export to neighbouring South Pacific countries began to be explored in the early 1960s and exports were soon being made, predominantly from the islands of Efate and Santo.

The establishment of a meat cannery in 1960 and three additional canneries during the 1960s combined with an increase in the number of slaughter houses during the 1960s to boost beef throughput capacity (Foy, Skea and Kamphorst 1992:46) and usher in a period of export expansion in the 1970s. The value of beef exports rose quickly from negligible levels in the early years of the study period to US\$2.8 million by 1972. Considerable progress was made in the 1970s, boosted by the commencement of operations of an abattoir on Efate in 1974 that enabled the export volume to increase from 408 tonnes in 1970 to 625 tonnes in 1975 (Foy et al. 1992:47). The annual average export value of US\$1.94 million in the 1970s compared with US\$0.44 million in the 1960s. The highest value reached was US\$3.0 million in 1978.

3.2.2 1980s

The well-documented problems experienced by the copra industry (for example, Fowler 1985, Weightman 1989) were the main reason why the 1980s were stochastically dominated by the 1960s and 1970s. Copra exports were depressed for much of the decade with the only relief coming during the world commodity boom in the middle of the decade. High world prices lifted export earnings to US\$14.9 million in 1983 despite low output due to the worst drought in recorded history (McGregor and McGregor 1999:54). This value was eclipsed by a decade-high US\$32.4 million in 1984 (second only to the export value achieved ten years earlier) and US\$15.5 million in 1985. Otherwise, values languished between US\$4.6 million and US\$12.6 million in the midst of low world prices for oils, copra quality problems, drought in 1983 and damage to palms and copra driers by Cyclones Eric and Nigel on northern islands in January 1985, Cyclone Uma on southern islands in February 1987 (Central Bank of Vanuatu 1987:7, Gannicott 1987:7, World Bank 1991:284) and Cyclone Anne in January 1988 (McGregor and McGregor 1999:92). The adverse effects on agricultural production of Cyclone Uma in the first half of 1987 were particularly severe, causing an estimated US\$24 million of damage (Dorrance, Elder and Juchniewicz 1987:6). Despite the mid-decade high export prices, the annual average copra export value in the 1980s was US\$11.72 million, down US\$7.13 million on the

figure for the 1970s. The coefficient of variation also increased, to 0.69 from 0.50 in the 1970s, as a result of both price and volume instability.

At independence, over one-half of arable land was owned by expatriates (World Bank 1991:279). Uncertainty about the security of land tenure, political appointments to estate management positions upon land distribution to traditional owners, and constitutional requirements for land to be returned to ni-Vanuatu that resulted in disputes among customary owners led to a deterioration of coconut plantations (World Bank 1991:279, ADB 2001:16) and a consequent decline in copra yields. A brief respite was experienced in 1984-85 when high copra export prices elicited a significant export supply response from smallholders such that export volumes in the three-year period, 1984 to 1986, averaged 41.3 kt compared with 36.7 kt in 1982-83. However, supply fell back with falling export prices during the second development plan period (1987-1991) and averaged just 29.0 kt over the final three years of the decade (NPSO 1992:74).

The annual cocoa export value averaged US\$1.48 million in the 1980s, below the average annual export value of US\$1.75 million in the 1970s. Export values fluctuated in the range from US\$0.6 million in 1982 to US\$2.1 million in 1983. They were depressed by poor bean quality (Fowler 1985, Weightman 1989:213), competition from the beef industry, abnormally low prices late in the decade, and climatic factors. These factors offset the expected gain in output from an expansion in production capacity from 1987 following earlier new plantings (Central Bank of Vanuatu 1987:8), especially from the Metenesel cocoa estate on Malekula (Weightman 1989:212, 215, NPSO 1992:77).

An attempt was made to revive the coffee industry on the island of Tanna in the early 1980s, following a decline in output with the departure of French plantation owners from Santo at independence (NPSO 1992:78). The creation of the Tanna Coffee Development Company enabled exports to increase to 84 tonnes in 1985 at a value of US\$0.23 million. But they had fallen again to negligible volumes and values by 1989, hindered by cyclone damage in 1987 (Central Bank of Vanuatu 1987:8).

Beef exports continued in the 1980s much as they had in the 1970s, averaging an annual value of US\$1.91 million. An increase in export volume to an average of 1018 tonnes in the period, 1987 to 1989, from an average 781 tonnes during the first development planning period (1982-1986) was offset by lower export prices (NPSO 1992:76). The export price decline was due primarily to weakening world prices and a higher proportion of export of manufacturing beef to Japan (NPSO 1992:76). Japan had become a major destination with the opening in 1978 of a second abattoir operated by a Japanese company. Located on Santo, its output was geared almost entirely to export production (Foy et al. 1992:47). Exporters diversified their

destinations, but market expansion was being held in check by production constraints (Central Bank of Vanuatu 1987:10).

Success in developing exports was elusive in Vanuatu throughout the study period. Combined with coffee, they accounted for only 1 per cent of total agricultural exports by the early 1990s. Only kava experienced any noteworthy export growth despite an inventory of numerous potential high-value non-traditional exports (Hassall and Associates 1983, Weightman 1989:216-252). A private sector-led revival in the domestic consumption of kava from the mid-1970s led to renewed enthusiasm for kava export. Following their survey of non-traditional export crops, Hassall and Associates (1983) suggested there was potential for the export of kava powder to the European pharmaceutical market and fresh kava to the beverage market. The volume of exports increased from 4 tonnes in 1984 to 14 tonnes in 1985, but values remained small relative to those of the main agricultural exports and were a mere US\$71 k in 1989. More prosperous times were ahead, however.

3.2.3 1990s

The 1990s stochastically dominated the 1980s slightly for the value of agricultural exports despite the adverse impacts of cyclones during the decade. This result was due mainly to an increase in kava exports, a strong performance in the beef export market and slightly less variable export values in aggregate. These factors were partly offset by a continued decline in copra export values. ADB (2001:50) asserted that the marketing of copra, cocoa and, for some time, kava exports by the Vanuatu Commodity Marketing Board had 'undermined the development of export-oriented agriculture'.

The final decade of the study period marked the almost complete ascendancy of smallholders in agricultural export industries. In 1991, they contributed 88 per cent of copra, 79 per cent of cocoa and all kava, and supplied 51 per cent of cattle throughput at the Santo abattoir (NPSO 1992:74-77, ADB 2001:37). ADB (2001:15) attributed their ascendancy to their cost advantages over estates, and lower exposure to pests, diseases and climatic risks.

Copra began the 1990s in a depressed condition, with export values averaging just US\$4.77 million until 1993 and copra price at an historic low (NPSO 1992:75). Production volume was kept at a reasonable level through price support (Callick 1991:16), with 1990 output exceeding pre-Cyclone Uma levels (McGregor and McGregor 1999:55), but it was again affected by a cyclone in 1992 (Fairbairn 1992:8). A mid-decade recovery resulted in an increase in copra export value to US\$6.45 million in 1994 and reasonably high export values in the second half of the 1990s, averaging US\$12.8 million for the last three years of the study period. As an indication of the limited ability of Vanuatu to diversify its exports, copra still

accounted for almost one-half of the total domestic export value over this three-year period. The crop averaged an annual export value of US\$8.4 million during the decade, 28 per cent down on the average value for the 1980s and little more than one-half the average annual value in the 1960s. Export volumes held up reasonably well during the decade for two main reasons. First, the decline in export volume that occurred in the 1980s was largely due to the waning of the estate sector, a trend that had run its course by the end of the 1980s when smallholders accounted for the bulk of supplies. Second, Vanuatu has done more replanting than other South Pacific countries such as Fiji and Tonga, and smallholders had been regularly replanting senile stands at an estimated 1900 hectares to 2700 hectares per annum such that they exceeded the rate of senility (NPSO 1992:75, ADB 1997:137). The peak planting year was most likely 1993. Around 20 per cent of plantings are now higher-yielding hybrid palms (McGregor and McGregor 1999:56). Export prices were also helped by continued improvement in copra quality, with the proportion of hot-air dried copra reaching 92 per cent in 1995 compared with just over 20 per cent in 1985 (Economics Division 1996:6).

The expected progress in the cocoa industry in the 1990s (World Bank 1991:288) failed to eventuate despite a promising start to the decade. The value of cocoa exports increased in the first two years of the 1990s, due in part to increased output from estates that were a joint venture between the government and the Commonwealth Development Corporation (Callick 1991:16, Statistics Office/DALH 1991:8), although only 500 hectares of the planned 1700 hectares in the Metenesel estate were planted and yield forecasts were over-optimistic (ADB 1997:138). Estate exports climbed from 144 tonnes in 1988 to 749 tonnes in 1991 (Economics Section 1992:16). But depressed world market conditions, financial difficulties experienced by the Metenesel joint venture that led the Commonwealth Development Corporation to cut its losses and withdraw from the project (ADB 1997:139), and the 1992 cyclone reversed this trend in 1992 and 1993. The value of exports halved from US\$1.9 million in 1991 to US\$0.9 million in 1993. A recovery in the world cocoa market was signalled by a rise in export values to US\$1.6 million in 1994, then to US\$1.7 million in 1997, before the industry suffered a further reversal of fortunes caused by lower export prices in the latter years of the decade that reduced export value to US\$1.2 million in 1999. This end-of-period value was below the decade averages of US\$1.5 million in the 1980s and US\$1.8 million in the 1970s.

The most interesting export story of the 1990s concerned kava. The average value of kava exports for the decade of US\$1.24 million does not tell the whole story. Exports began the decade slowly at US\$0.10 million, and surpassed their previous highest level in 1992 at US\$0.14 million. They then expanded quite rapidly to US\$0.72 million in 1997. This was a prelude to a dramatic increase over the latter years of the 1990s that resulted in an export value of US\$7.10 million in 1998. Kava had been

catapulted to the third-ranked export. Unfortunately, the momentum was not maintained, and the export volume more than halved in 1999 to bring the export value back to a still respectable US\$2.94 million. That was sufficient for kava to be the fourth most important export by value. Kava's recent export success can be defined in terms of its well-understood production methods, relative freedom from disease, suitability to smallholder production, a wealth of planting material, high returns to labour, complementarity with other activities in the farming system, and favourable product attributes that include multiple uses, storability and ease of transport (Fleming 1996:115). Its problems are similar to those outlined for other South Pacific countries and relate mainly to export marketing: low and irregular supplies, inconsistent quality and 'lack of clear rules-of-the-game to govern market operations' (Lebot 2001:22).

Beef exports in the 1990s maintained a substantial and steady value. They began the decade at US\$2.6 million and reached an export value of US\$3.3 million in 1994. This value was approximately maintained throughout the decade, finishing at US\$3.2 million. Foy et al. (1992:48-49) attributed the continued success of the industry to five factors:

- Cattle were introduced gradually into both the estate and smallholder farming systems by the farmers themselves, as a secondary component to copra, rather than being introduced as the primary commercial activity by outside agencies. Beef production then became a profitable activity in its own right.
- The early introduction of cattle meant that livestock numbers had built up to levels capable of supporting the export industry when overseas markets became available. Freedom from disease has enabled producers to maintain livestock numbers.
- The involvement of the estate sector meant there have been sufficient and consistent numbers of cattle being turned off to ensure continuity in processing and marketing.
- The government has provided suitable regulatory and facilitatory support to the industry.
- Access to overseas markets has been continuous and remunerative.

The industry is not without threats, though. In particular, notwithstanding continuous and remunerative access to overseas markets so far, it has not always been assured and will remain hostage to the vagaries of the world trading environment and protectionist policies in importing countries. Foy et al. (1992:50) gave a couple of examples of how fickle export markets can be. Demand in the New Caledonia market was greatly reduced when the nickel industry collapsed in 1978. An alternative market that was found in the French Antilles was scuppered by a tightening of EU regulations

in 1983. As luck would have it, the industry was saved by the timely entry to the Japanese market. Also, beef began to be supplied from the Vila abattoir to the Solomon Islands and Papua New Guinea markets in 1995 following the signing of a duty-free trade agreement (ADB 1997:155). While it is less than a perfect destination, being a low-quality market for Vanuatu's relatively high-quality beef (ADB 2001:37), it nevertheless provides a degree of market diversification.

Maintaining the currently important Japanese market and further diversifying market destinations depend on the ability of the industry to overcome some major difficulties. They include high processing and transport costs, low levels of throughput, remoteness from export markets, international health accreditation requirements and a limited number of market destinations into which it is possible to diversify (Foy et al. 1992:50-51).

An attempt was made to emulate the success achieved by Tonga in exporting squash to Japan, in direct competition with Tongan growers. Exports commenced in 1992 on Efate where soils were suitable, there was good access to port facilities and climatic conditions were satisfactory so long as there were adequate irrigation facilities (ADB 1997:141). The export value reached a promising US\$1.0 million in 1995 at which stage analysts were hopeful that the industry would become a sustained and major agricultural export earner (ADB 1997:155). But production and marketing problems soon set in and the venture failed as the market share was lost to Brazilian exporters (ADB 2001:18). Strangely, the industry did not even rate a mention in the discussion by ADB (2002b:85-100) of recent agricultural developments and future prospects. Climatic conditions were not as suitable as in Tonga when irrigation services failed, smallholders (particularly women) did not embrace the crop as strongly and, as in Tonga, the product is subjected to occasional cyclones and depressed prices from heavy supply into the small market niche.

Despite numerous attempts and a lot of resources to develop a viable export market for coffee, export values had ceased to be significant by the 1990s with production aimed mainly at tourists in the domestic economy (Weightman 1989:193). This sobering experience did not stop ADB (2002b:99-100) from spruiking the crop's export potential, with greater reliance on smallholder coffee producers. The difficulties encountered in previous efforts to develop the industry need to be overcome before success will finally be achieved after many false dawns.

3.3 Non-agricultural exports

Vanuatu has not been particularly successful in developing non-agricultural exports, in large part because it has been a high-cost economy even by South Pacific standards (Gannicott 1987:8, Fallon and Karabalis 1992:13, ADB 2001:44-49). ADB (1997:82) reviewed the evidence on costs, and concluded that:

... there is substantial evidence to suggest that costs are not only high in Vanuatu, but are in fact one of the highest in the Pacific island region. Wage costs appear higher than in both Fiji and Tonga. Lending interest rates are high, reflecting wide interest margins, and above the norm ... in the region. Intermediate costs are also high, which is compounded by the tax regime.

Fish re-exports were substantial over much of the study period (see Riepen and Kenneth 1989), but are omitted from the analysis because only domestic commodity exports are considered. The only non-agricultural export industries of note in the first two decades of the study period were manganese and timber.

Manganese concentrate was produced at an open-cut mine on Efate, beginning in 1962, and exported mainly to Japan until 1982. The highest export value was recorded in 1976 at US\$1.9 million. Thereafter, export values declined steadily to US\$0.25 million in 1982 after which exports ceased, production having stopped two years earlier (ADB 1997:209).

Exports of timber did not begin until the late 1970s and even then they were at low levels. Although Vanuatu has modest forest resources compared with Papua New Guinea and Solomon Islands, timber export values did manage to increase to reasonable levels in the early 1980s and reached US\$1.7 million in 1984. For the rest of the 1980s, values varied between US\$0.6 million and US\$1.9 million. They were substantially higher on average in the 1990s than in the 1980s due to progress made late in the decade. Export volumes were low in the early 1990s, valued at an annual average of just US\$0.65 million in the first three years, following problems at two new sawmills (Falvey 1991:10) and a ban placed on the export of unprocessed logs in 1993 in a bid to add greater value to timber exports (NPSO 1992:81). The tactic of adding value bore fruit as there was significant investment in processing facilities for timber products from 1995 onwards, including a factory to process sandalwood oil in 1999 (ADB 2001:16). Exports finished the study period quite strongly, averaging US\$3.4 million per year in the final three years of the decade. Unlike the situation in the timber industries in Papua New Guinea and Solomon Islands, Vanuatu was successful in ensuring that only processed timber was exported from 1993. Its volume more than doubled from 5107 cubic metres in 1994 to 12 219 cubic metres in 1999 (Hunt 2001b:14). The processors captured most of the value added (Hunt 2001b:7).

Vanuatu has been mildly successful in developing exports of marine products, mainly shells, in its coastal waters that contain 'a diverse array of marine and freshwater life' (ADB 2001:133). Shell exports were minor for much of the study period but achieved a small degree of significance in the late 1980s and 1990s. Based on high-value trochus shells, the export value touched US\$1.5 million in 1992 and averaged US\$0.7 million for the final decade (ADB 2001:18). Export volumes of trochus shells fell between 1992 and 1999 as concerns increased about the over-exploitation of the trochus fishery (Preston 1996:23, ADB 2001:93).

4. Conclusions

Stochastic dominance analysis was used to assess export performance in Solomon Islands and Vanuatu, two Melanesian countries that are quite well endowed with natural resources. The dominant decade for total exports in Solomon Islands was the 1990s. Total export values increased over the study period, brought about by a significant increase in the value of the non-agricultural resource-based exports of fish, timber and gold. Agricultural exports showed small increases but the average annual rate of growth was only 1.3 per cent for agricultural export values compared with 10.7 per cent in non-agricultural export values.

The record of commodity export performance in Vanuatu over the study period was less impressive. Some success was achieved in the 1970s in that there was a marginal stochastic dominance of the 1970s over the 1960s for both total and agricultural export values. However, agricultural export values fell during the 1980s, being the major contributor to a decline in total export values for the whole study period of 1.5 per cent per annum on average. This decline did show signs of abating in the final decade of the study period as there was little to choose between the 1980s and 1990s in stochastic dominance in agricultural export values. Non-agricultural exports remained at low levels throughout the study period.

Results suggest that both countries are capable of achieving sustainable economic development, given their generous natural resource endowments. However, many factors could impede progress in this direction, as witnessed by the current political unrest and crisis in public finance in Solomon Islands.

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Appendix 1 Solomon Islands Total Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	20.54	4.02	16.00	28.90	
1970s	44.04	15.56	26.30	83.10	0.0310
1980s	72.78	12.25	60.70	105.30	0.0171
1990s	110.53	30.07	56.90	163.20	0.0109

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN +/- .100000E+00

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s
THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 3 IS DOMINANT

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 3 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTION CDFS CROSS 1 TIMES

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000
TROUBLE -- FOUND 4 TO BE DOMINANT AT THE HIGHEST RAC EXAMINED
-- SHOULD HAVE FOUND AN RAC LARGE ENOUGH THAT 3 DOMINATED
-- ADDING AN RAC = .1000000000E+00 SOMEWHERE ABOVE WHICH PROPER
DOMINANCE OCCURS

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPOSITE RESULTS

BELOW RAC = .0000000001 THE DOMINANT SET IS 3 1980s 4 1990s

ABOVE RAC = .0000000001 THE DOMINANT SET IS 4 1990s

Appendix 2 Solomon Islands Agricultural Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	16.57	1.90	14.10	21.30	
1970s	17.85	7.96	7.50	33.40	0.0581
1980s	21.92	10.26	11.30	47.50	0.0503
1990s	23.48	6.36	14.50	35.40	0.0441

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN +/- .100000E+00

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s
THE DISTRIBUTION CDFS CROSS 3 TIMES

A BREAKEVEN RAC = .0463029889 ABOVE WHICH DIST 1 DOMINATES

HERE THE UTILITY DIFFERENCE = .88137857E-15

2 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTION CDFS CROSS 1 TIMES

3 HAS BEEN FOUND DOMINANT BETWEEN -.1000000000 .1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTION CDFS CROSS 2 TIMES

3 HAS BEEN FOUND DOMINANT BETWEEN .1000000000 -.1000000000

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTION CDFS CROSS 1 TIMES

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000

A BREAKEVEN RAC = -.0370438283 ABOVE WHICH DIST 4 DOMINATES

HERE THE UTILITY DIFFERENCE = .93004694E-15

COMPOSITE RESULTS

BELOW RAC = -.0370438283 THE DOMINANT SET IS 3 1980s

ABOVE RAC = -.0370438283 THE DOMINANT SET IS 4 1990s

Appendix 3 Solomon Islands Non-Agricultural Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	3.97	3.59	1.33	12.92	
1970s	26.20	9.53	13.95	49.77	0.0663
1980s	50.86	4.81	42.97	57.82	0.0260
1990s	87.05	25.79	42.37	136.62	0.0145

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN +/- .100000E+00

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s
THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 3 IS DOMINANT

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 3 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTION CDFS CROSS 1 TIMES

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000
TROUBLE -- FOUND 4 TO BE DOMINANT AT THE HIGHEST RAC EXAMINED
-- SHOULD HAVE FOUND AN RAC LARGE ENOUGH THAT 3 DOMINATED
-- ADDING AN RAC = .1000000000E+00 SOMEWHERE ABOVE WHICH PROPER
DOMINANCE OCCURS

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPOSITE RESULTS

BELOW RAC = .0000000001 THE DOMINANT SET IS 3 1980s 4 1990s

ABOVE RAC = .0000000001 THE DOMINANT SET IS 4 1990s

Appendix 4 Vanuatu Total Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	26.52	6.90	15.60	37.40	
1970s	26.78	9.26	12.90	43.00	0.0380
1980s	17.07	7.74	9.70	37.60	0.0456
1990s	18.77	5.66	12.00	31.30	0.0558

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN .100000E

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s

THE DISTRIBUTION CDFS CROSS 3 TIMES

A BREAKEVEN RAC = .0137459374 ABOVE WHICH DIST 1 DOMINATES

HERE THE UTILITY DIFFERENCE = -.40864255E-15

2 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s

THE DISTRIBUTION CDFS CROSS 1 TIMES

1 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000

1 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s

THE DISTRIBUTIONS DO NOT CROSS -- 1 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s

THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s

THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s

THE DISTRIBUTION CDFS CROSS 1 TIMES

4 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000

A BREAKEVEN RAC = -.0744214656 ABOVE WHICH DIST 4 DOMINATES

HERE THE UTILITY DIFFERENCE = .00000000

COMPOSITE RESULTS

BELOW RAC = .0137459374 THE DOMINANT SET IS 2 1970s

ABOVE RAC = .0137459374 THE DOMINANT SET IS 1 1960s

Appendix 5 Vanuatu Agricultural Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	22.07	5.41	13.50	30.90	
1970s	22.88	9.24	9.60	40.50	0.0448
1980s	15.19	7.67	8.10	35.30	0.0525
1990s	13.81	5.04	8.50	24.70	0.0690

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN .100000E

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s
THE DISTRIBUTION CDFS CROSS 1 TIMES

A BREAKEVEN RAC = .0302479946 ABOVE WHICH DIST 1 DOMINATES
HERE THE UTILITY DIFFERENCE = .19040123E-15

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTION CDFS CROSS 1 TIMES

1 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000
1 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 1 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTION CDFS CROSS 5 TIMES

3 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 .1000000000
3 HAS BEEN FOUND DOMINANT BETWEEN .0000000000 -.1000000000

COMPOSITE RESULTS

BELOW RAC = .0302479946 THE DOMINANT SET IS 2 1970s

ABOVE RAC = .0302479946 THE DOMINANT SET IS 1 1960s

Appendix 6 Vanuatu Non-Agricultural Exports

SUMMARY STATISTICS ON THE DATA (US\$ M)

Distribution	Mean	Std dev	Min	Max	RAC
1960s	4.44	2.32	.31	8.75	
1970s	3.90	1.31	2.00	5.66	0.2398
1980s	1.87	.85	.54	3.26	0.3466
1990s	4.97	.87	3.58	6.60	0.2924

PAIRWISE RESULTS

THE BOUND READ IN FOR THE RAC LIMITS IT TO BETWEEN +/- .100000E+00

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 2 CALLED 1970s
THE DISTRIBUTION CDFS CROSS 1 TIMES

1 HAS BEEN FOUND DOMINANT BETWEEN -.1000000000 .1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTION CDFS CROSS 1 TIMES

1 HAS BEEN FOUND DOMINANT BETWEEN -.1000000000 .1000000000

COMPARING DISTRIBUTION 1 CALLED 1960s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTION CDFS CROSS 1 TIMES

4 HAS BEEN FOUND DOMINANT BETWEEN .1000000000 -.1000000000

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 3 CALLED 1980s
THE DISTRIBUTIONS DO NOT CROSS -- 2 IS DOMINANT

COMPARING DISTRIBUTION 2 CALLED 1970s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPARING DISTRIBUTION 3 CALLED 1980s TO DISTRIBUTION 4 CALLED 1990s
THE DISTRIBUTIONS DO NOT CROSS -- 4 IS DOMINANT

COMPOSITE RESULTS

AT ALL RACS THE DOMINANT SET IS 4 1990s

Figure 1 Cumulative density functions, Solomon Islands: total exports

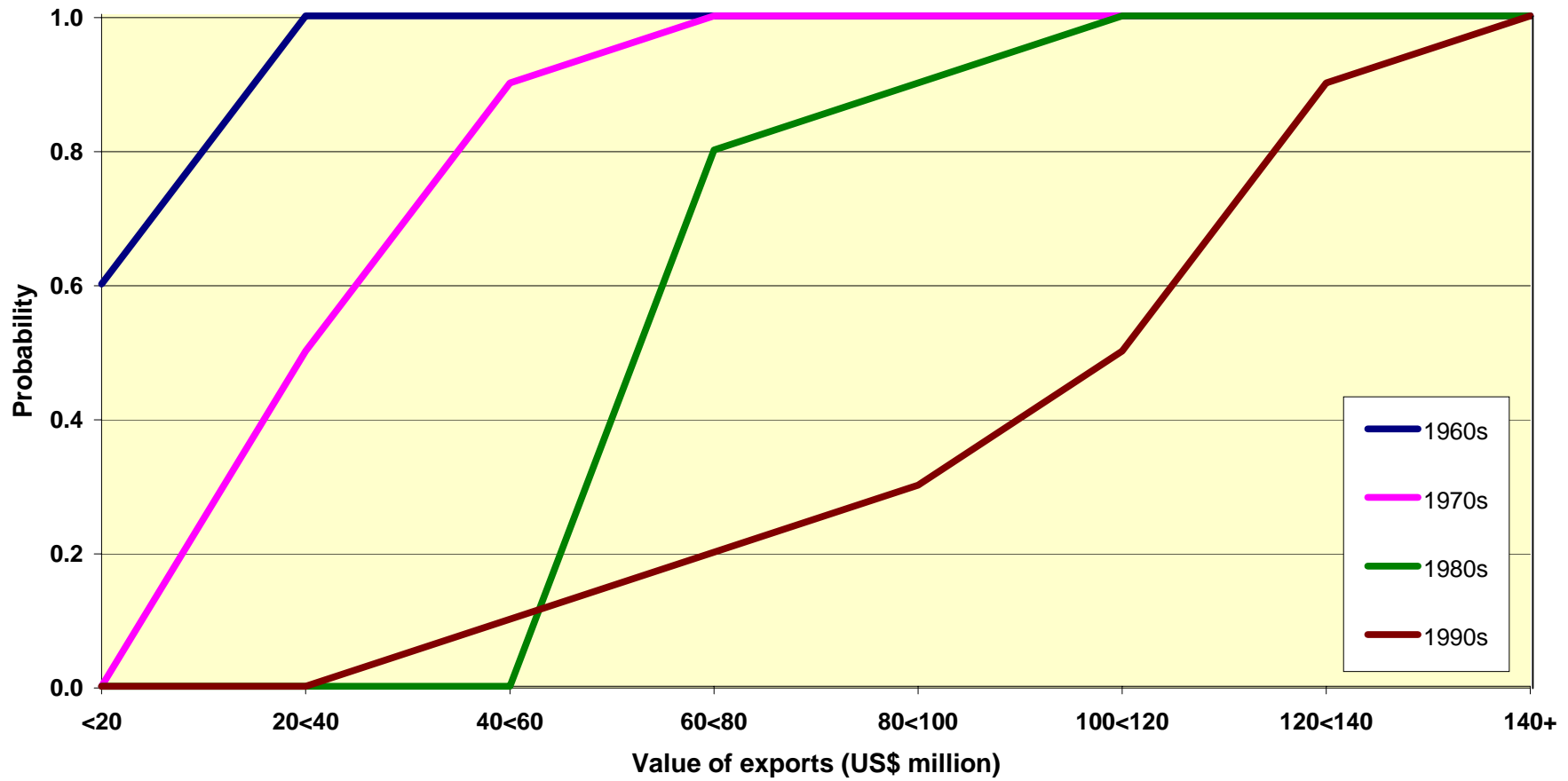


Figure 2 Cumulative density functions, Solomon Islands: agricultural exports

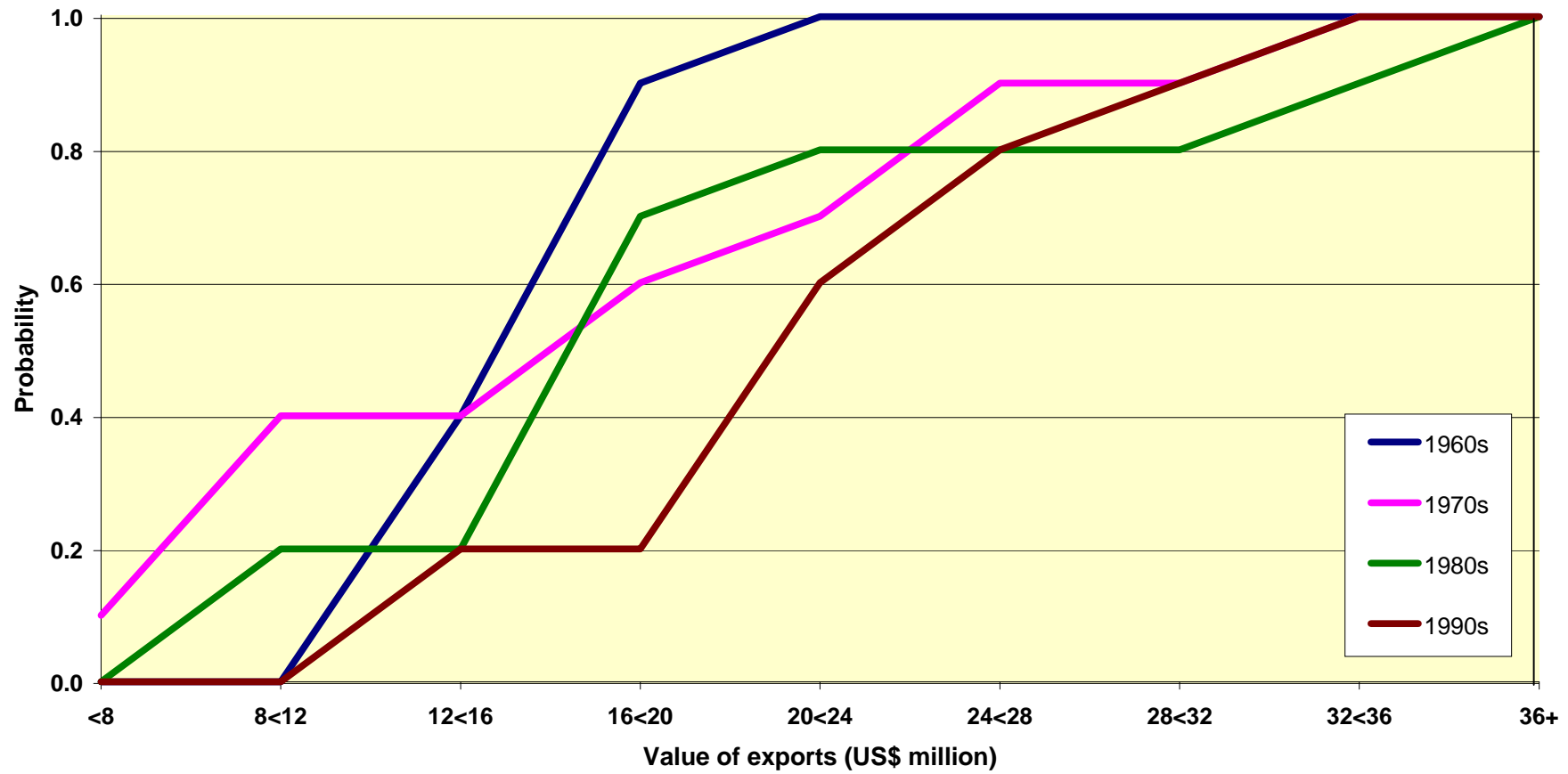


Figure 3 Cumulative density functions, non-agricultural exports: Solomon Islands

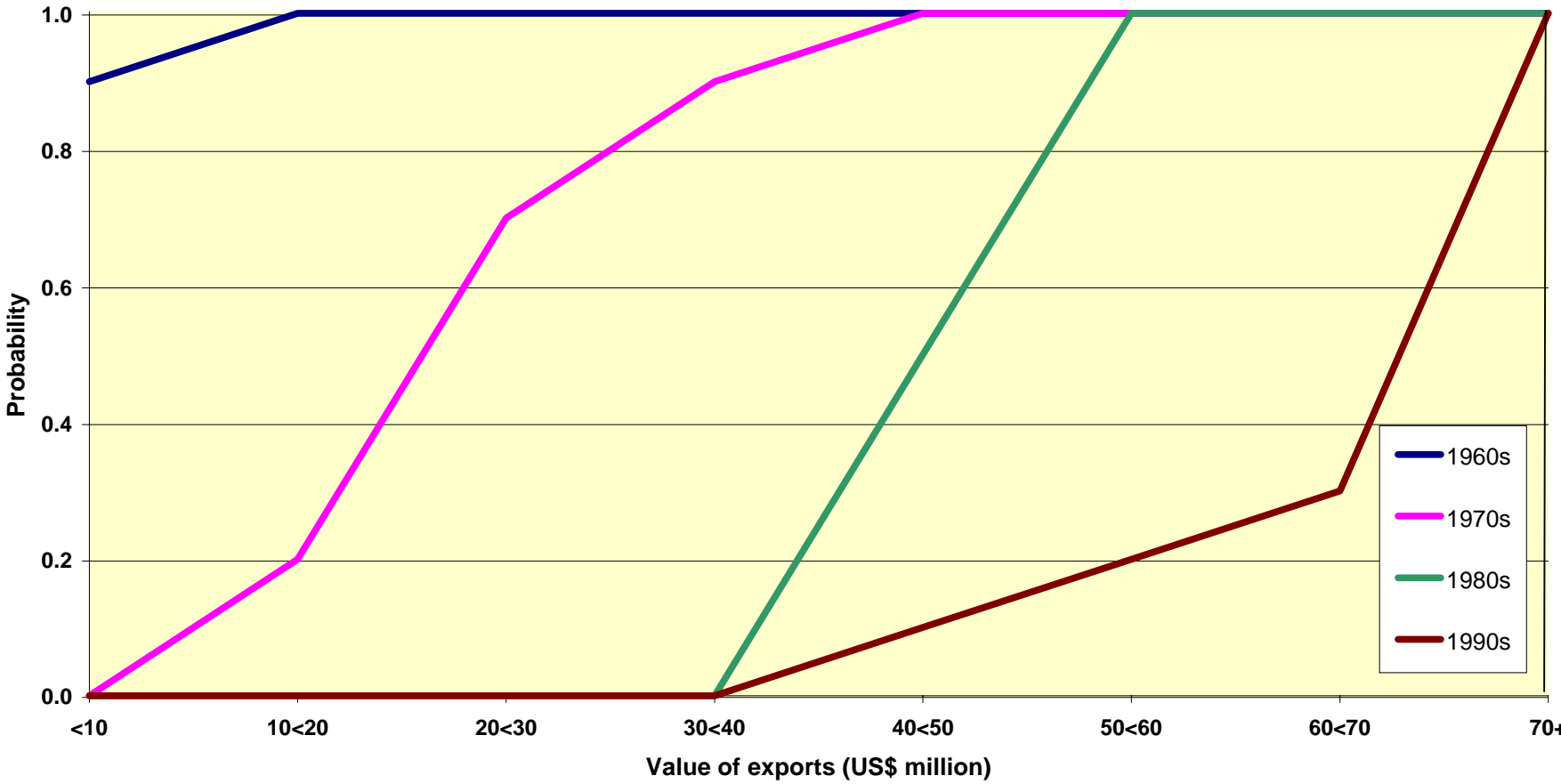


Figure 4 Cumulative density functions, total exports: Vanuatu

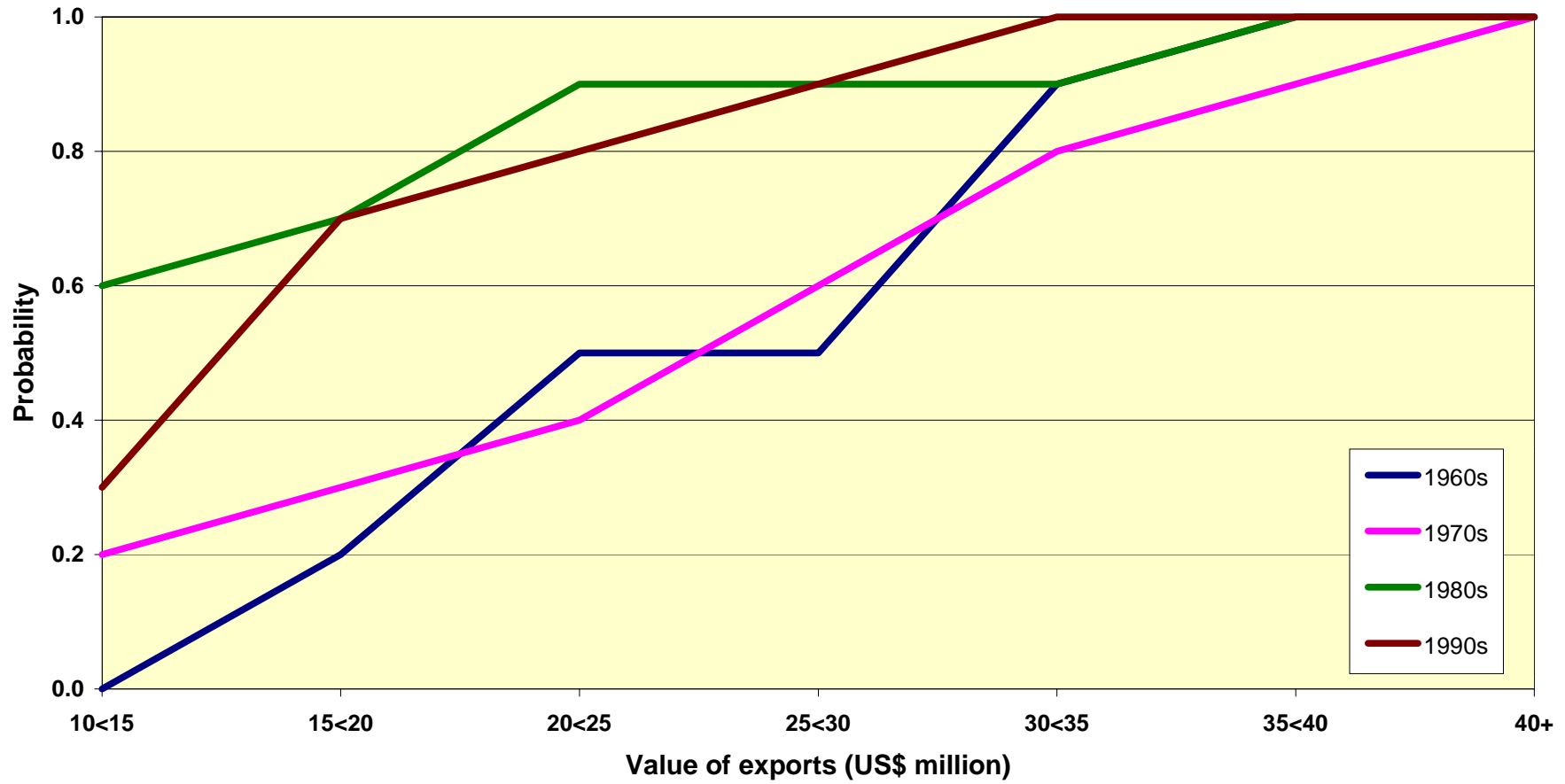


Figure 5 Cumulative density functions, agricultural exports: Vanuatu

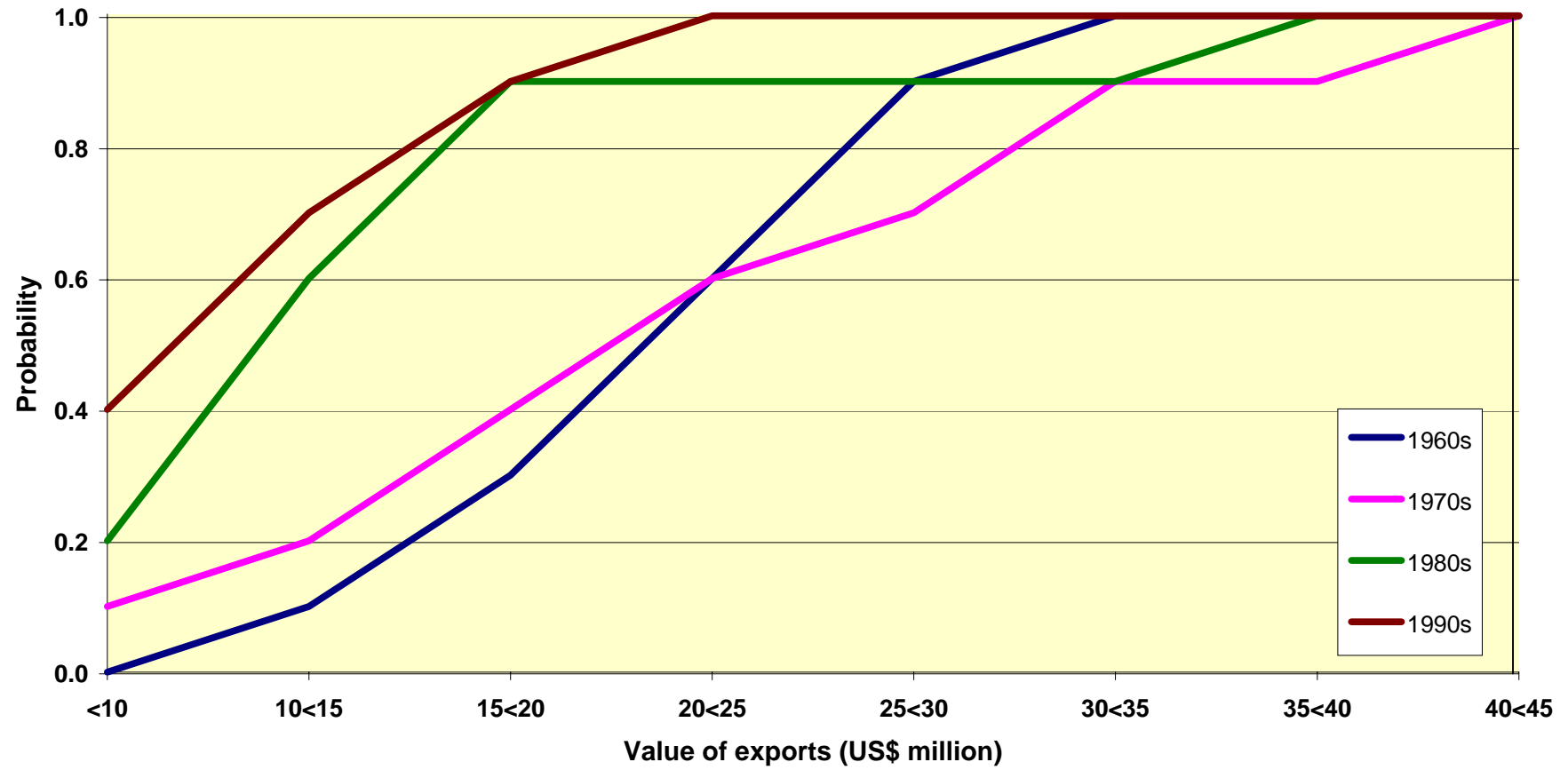


Figure 6 Cumulative density functions, non-agricultural exports: Vanuatu

