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Research School of Pacific Studies ANU

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Berhanu Woldekidan completed his PhD dissertation,'Mauritius: An export-led economic success', at the National Centre for Development Studies, Australian National University in June, 1992.

Islands/Australia Program

National Centre for Development Studies

This paper originates in the Islands/Australia Program at the National Centre for Development Studies. The size, geographic isolation and histories of the Pacific island states create special development problems. Australia plays an important role in the region, both as an aid donor and trading partner. The National Centre for Development Studies has given priority to research on the islands since 1975. The Islands/Australia Program provides policy insights, primarily for Australia in its relations with its Pacific neighbours, but also for the island governments and international agencies. This stream of the Economics Division Working Papers widens the former Islands/Australia Working Paper series. Research on the area is being undertaken by other scholars in the Division. The National Centre for Development Studies continues to disseminate analysis of the island economies through its *Pacific Policy Papers, Pacific Research Monographs* and the *Pacific Economic Bulletin.*

Abstract

This paper evaluates the achievements and contributions of export processing enterprises in Mauritius. It reviews the generation of employment, private direct foreign investment, manufactures exports and economic growth.

The impact of domestic economic policies on export growth are analyzed. An econometric analysis is applied to establish the relationship between export growth and major macroeconomic variables. The statistical results suggest that the export performance of export processing enterprises was highly influenced by tariff exemptions and lower nominal wages. The devaluation of the real exchange rate also contributed to export performance, although to a smaller extent. The welfare effects of export processing enterprises are analyzed using a cost-benefit approach and found to have a large positive impact.

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Welfare impact of export processing zones on a small island economy: Mauritius

In the 1960s, like many developing countries, Mauritius sought to improve its deteriorating balance of payments and to provide employment for the rapidly growing labour force, by adopting import-substituting manufacturing as its development strategy. In addition to quantitative import restrictions and protective tariffs in 1964 the government passed the Development Incentives Act to encourage the expansion of import-substituting industries. Selected firms, which manufactured primarily for the domestic market, were granted development certificates and known as development certificate firms.

Under the Act, a firm qualifying for a development certificate enjoyed tax 'holidays' and other incentives in addition to protection. These incentives included five to eight years of corporate tax exemption, five years tax free dividends and tariff exemption on imported capital goods. These incentives encouraged the choice of products and techniques which were inappropriate to the country's resource endowment and resulted in excess capital intensity and inefficiency. The incentives made investment profitable for entrepreneurs, but the import-substituting industries had low social returns and failed to create employment. By 1970 the development certificate firms had created only about 1200 jobs. The balance of payments did not improve. On the contrary, the development certificate policies hindered specialization in labour-intensive manufactures exports and created a bias against agricultural and service exports. The smallness of the domestic markets and the absence of technical knowledge, managerial and entrepreneurial skills, limited investment in import-substitution.

In 1970 the government therefore explored the option of establishing manufactures for export with the assistance of foreign enterprises under a system of 'export processing zones'. The objective was to reduce balance of payments constraints, generate employment and thus stimulate the overall economy through 'export-led growth'.

Export processing zones are an extension of the concept of free trade zones and industrial estates (Hughes 1988; International Labour Organization 1988). They were pioneered in Ireland, Puerto Rico, Taiwan and the Republic of Korea in the 1950s and 1960s. Most of the export processing zones were intended to provide areas where scarce infrastructure could be concentrated and a 'free trade' environment created for domestic and foreign firms producing for export. Some economies such as Hong Kong and Singapore do not have a specially designated zone. The duty free export and import environment of Hong Kong and Singapore (after 1965) resembled economy-wide export processing zones. In Mauritius the 'export processing zone' did not refer to a given area, but defined firms producing for export markets regardless of their location as an 'export processing zone'. Hereafter in this study they are referred to as export processing enterprises. Rabbani (1980) refers to such industries as export processing factories.

The 'first best' solution in seeking export-led growth is to abandon protection. However, abolishing protection can often only be implemented gradually for political reasons. If protection is dismantled, some entrepreneurs and workers in protected industries would lose their businesses and employment. This leads to strong political opposition. Those who would gain from the reduction in protection, consumers and workers who would obtain jobs in new export industries, are not organized. Export processing zones can thus be considered as a 'second best' alternative to liberalizing an economy. They may provide an initial phase for outward-looking industrialization (Lee 1984; Spinanger 1984). In a small, low wage country such as Mauritius, export processing enterprises may give the domestic economy access to foreign capital in the form of private direct foreign investment with its 'package' of capital, technology, management and marketing knowledge that the country could not otherwise obtain.

About 700 export processing zones have been established overall in the world, mainly in the 1970s, as a means of promoting manufactures exports and attracting foreign investment. Only a dozen or so, including Mauritius, have been successful (Hughes 1988).

Conditions for success of export processing enterprises in Mauritius

Political stability

Political stability was important in stimulating the growth of export processing enterprises. Mauritius has traditionally had a stable and democratic system of government. Political stability has allowed formulation and implementation of consistent economic and social policies and attracted foreign capital.

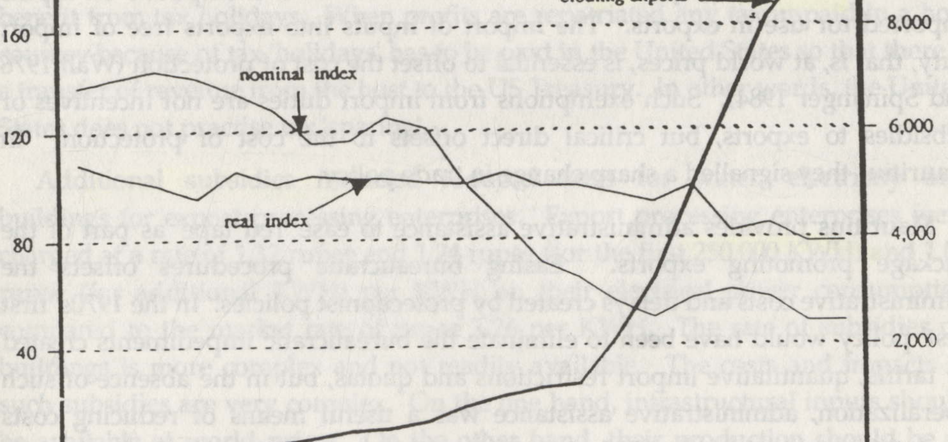
Macroeconomic policies

Macroeconomic policies, particularly exchange and interest rate management, made production for export competitive and profitable.

The real exchange rate has played an important role in determining competitiveness and export profitability in Mauritius. The devaluation of the real exchange rate in the late 1970s raised proceeds in domestic currency for producers of exportables whose prices were determined in foreign currencies on the world market. The nominal exchange rate was allowed to depreciate by the difference between Mauritian inflation rates and those of its major trading partners, so that the competitiveness of Mauritian exports was maintained.

Inflation was the principal cause of the need for adjustment in the nominal exchange rate, but devaluation had inflationary effects in Mauritius because of its dependence on food and other imports. Hence, government policy focused on low inflation in the 1980s. Exchange rate controls were freed in 1984 as a consequence.

Figure 1 Nominal and real effective exchange rates and export processing (clothing) exports, 1971-90



Sources: Mauritius Central Statistical Office, *Digest of Industry* (various issues) and International Monetary Fund 'Export Processing Zone for Development: the Mauritian example, Washington, D.C., 1990.

The depreciation of the real effective exchange rate was most prominent between 1983 and 1987 (Figure 1). The exchange rates that reflected relative inflation and balance of payments trends improved the competitiveness of exports. As a result exports grew most rapidly between 1983 and 1987.

The real lending rate in Mauritius ranged from 10 to 13.5 per cent in 1986. This was higher than in Singapore (8.2 per cent) and the Republic of Korea (9.6 per cent). Lending rates have thus not encouraged the excess use of capital, reflecting the relative scarcity of capital in Mauritius and stimulating employment.

Infrastructure

Low inflation was founded on sound fiscal management. Revenues were raised to enable Mauritius to develop communications, transportation, an efficient harbour, energy supplies and social infrastructure (schools and health services). The attention to infrastructure was part of the favourable environment for exporters.

Provisions of the Export Processing Act

Export Processing Act passed in 1970 signalled the shift from protected import substitution to export orientation. An export enterprise certificate, making a firm eligible for the provisions of the Export Processing Act was issued to each firm participating in the program.

The most important provisions of this Act were tariff exemptions on inputs imported for use in exports. The import of inputs into exports free of import duty, that is, at world prices, is essential to offset the cost of protection (Wall 1976 and Spinanger 1984). Such exemptions from import duties are not incentives or subsidies to exports, but critical direct offsets to the cost of protection. In Mauritius they signalled a sharp change in trade policy.

Mauritius provides administrative assistance to ease 'red tape' as part of the package promoting exports. Easing bureaucratic procedures offsets the administrative costs and delays created by protectionist policies. In the 1970s 'first best' policy would have been to eliminate the bureaucratic impediments created by tariffs, quantitative import restrictions and quotas, but in the absence of such liberalization, administrative assistance was a useful means of reducing costs created by protection. In 1985 quantitative import restrictions and quotas were eliminated, beginning the process of trade liberalization that is required to put exports on a sound basis. To some extent tariff protection was raised to compensate for the removal of quantitative restrictions.

Mauritius was one of the minority of developing countries that had no restriction on foreign ownership of manufacturing. Capital, profits and dividends could be remitted abroad freely. This created a welcoming environment for foreign investors that was more important than the provision of subsidies.

In addition to the offsets to protection and the creation of a favourable environment for foreign investors, export processing enterprises in Mauritius were, however, also offered fiscal and financial subsidies. The fiscal incentives included 20 years corporate income tax 'holidays'. Complete exemption of corporate tax for 10 years, 50 per cent exemption from 10-15 years and 25 per cent exemption from 15-20 years were provided. Profits distributed as dividends were not subject to company tax but were taxable as income to the recipients after a 5 year exemption. The tax incentive provision was modified in 1985 for new enterprises and established enterprises were allowed to choose between the old and new provisions. Under the new provisions corporate tax was set at 15 per cent during the life of the enterprise with dividends exempted from income tax for the first 10 years. Industries other than export processing and import substitution were taxed at 35 per cent.

Mauritius began to recognize that tax exemptions are costly to the host country in terms of foregone revenue. Doubts about the effectiveness of tax 'holidays' also began to arise. Practical experience has long suggested that tax exemptions are not effective but mostly redundant (United Nations 1968, Guisinger *et al* 1985 and Hughes 1988). Some investors, for example those from the United States, do not benefit from tax holidays. When profits are repatriated any tax unpaid in a host country because of tax 'holidays' has to be paid in the United States so that there is a transfer of revenue from the host to the US Treasury. In other words, the United States does not practise tax 'sparing'.

Additional subsidies included reduced rates for water, electricity and buildings for export processing enterprises. Export processing enterprises were charged at a rate of 1.32 rupee and 1.24 rupee (for the first 250,000 KWH) and 1.03 rupee (for additional KWH) per KWH on their electrical power consumption compared to the market rate of rupee 2.26 per KWH. The rate of subsidies on buildings is more complex and not readily available. The costs and impacts of such subsidies are very complex. On the one hand, infrastructural inputs should be available at world prices. On the other hand, their production should be so efficient that they can be produced at world prices without subsidy. Otherwise they have high social costs. In Mauritius both approaches, a drive for efficiency and subsidies that brought the prices facing exporters to international levels, were adopted.

Mauritian firms holding export processing certificates were also granted access to credit from domestic banks at some 3.75 percentage points less than the market rate. Privileged access to credit at subsidized interest rates makes capital artificially cheap in relation to labour. This can lead to excessively capital intensive techniques of production which are not suited to a lower income country's resource endowment. Costs of production are raised and employment is repressed. But as noted above, the real lending rate in Mauritius was relatively high, and the availability of subsidized capital for export processing enterprises was limited to affect the choice of technique and hence capital to labour ratios.

Tariff exemptions on imported inputs, free repatriation of profits and easing 'red tape' offset protectionist and related bureaucratic costs, while subsidy payments imposed on the economy were limited, so that they did not create major distortions in the economy.

Labour

Internationally competitive wage and labour costs are important determinants of export competitiveness. High real labour costs lead to capital-intensive production which is not compatible with the resource endowment of countries such as Mauritius. Kearney (1990) noted that labour costs in Mauritian export processing enterprises were substantially lower than in other countries, and remained so until 1988. For example, the labour costs of Mauritius were thought to be only 25 per cent of those of Hong Kong and Singapore in the 1980s (Kearney 1990). To stimulate exports, minimum wages continued to be lower for export processing enterprises than for other sectors. To reflect the uncertainties in the world market, moreover, labour laws allowed export processing employers greater flexibility than in import-substituting manufacturing in terminating employment (Hein 1988).

Wages in manufacturing in Mauritius have been about 18 per cent of those in Hong Kong, 7 per cent of those in France and 5 per cent of those in West Germany (the home countries of the major investors) (Table 1). Although the ratios of wages in Mauritius to wages in Hong Kong and France were somewhat higher in clothing than in manufacturing overall, they were still low.

Table 1 Total manufacturing and wearing apparel earnings per hour and index of real earnings in manufactures: selected countries, 1976-85

	Mauritius	France	Germany	Hong Kong
Earnings per hour (US$)				
Manufactures				
1976	0.22	2.9	4.1	0.7
1980	0.37	5.3	7.3	1.1
1983	0.33	4.4	5.9	1.4
1985	0.28	4.2	5.5	1.6
Wearing apparel				
1976	0.2	2.2	3.1	.7
1980	0.3	4.1	5.4	1.1
1983	0.3	3.4	4.3	1.4
1985	0.3	..	3.9	1.6
Real earnings (index)[a]:				
Manufactures				
1971-75	86.2	81.1	87.7	85.4
1976-81	100.0	100.0	100.0	100.0
1982-86	94.0	108.6	101.7	140.7
1987	115.4	111.2	109.3	163.9

[a] Data for wearing apparel are not available.
Source: ILO, *Statistical Year Book of Labour*, Geneva, 1986 and W. Ginneken, and R. Hoever, 'Industrialization, employment and earnings (1950-87): an international survey', *International Labour Review*, 128:5, 1989.

The rate of increase in real earnings in manufacturing was lower in Mauritius than in Hong Kong, the major investor. However, a low wage rate is not alone sufficient for investment to take place. Other developing countries had even lower wages than Mauritius. Mauritius has a relatively educated labour force, and hence relatively high productivity. It also has the other aspects of the environment required by foreign investors as indicated above.

The growth of export processing enterprises

Enterprises

Export processing enterprises expanded rapidly, greatly influencing the performance of the Mauritian economy. Nearly 90 enterprises were established by the end of 1977. These enterprises created more than 17,000 jobs, with an average 200 employees per enterprise. Expansion slowed in 1978-82 with the number of enterprises increasing by only 25 to 115 and employment growing only at an average yearly rate of 7 per cent. But between 1983 and 1988 the number of exporting enterprises grew rapidly again, reaching 591 enterprises in 1988. Maximum growth occurred in 1985 when the number of firms increased from 197 to 290 (Table 2).

Table 2 Number of export-oriented enterprises by type of product, 1983-88

	1983	1984	1985	1986	1987	1988
Wearing apparel	64	102	174	276	364	408
Pullovers	27	37	44	53	61	64
Gloves	3	5	5	5	5	5
Under garments	34	60	125	218	298	339
Textiles	8	11	13	18	23	27
Flowers	15	16	19	21	28	28
Other[a]	59	122	84	93	116	128
Total	146	197	290	408	531	591

[a] Includes leather products, wood and furniture, optical goods, watches and clocks, jewellery, toys etc.

Source: World Bank, *Mauritius: managing success*, Washington, D.C., 1989a.

Domestic and foreign investment

Investment in export processing did not speed up until the mid 1980s when the policy reforms undertaken in the early 1980s were coupled with world economic recovery and market growth.

Although export processing enterprises attracted more foreign investment than the rest of manufacturing, even they have relied mostly on domestic capital. Only about a third of export processing investment came from foreign sources originating in Hong Kong, France, Sweden and Germany. Most, about 60 per cent, of the foreign capital came from Hong Kong.

Table 3 Total investment in Mauritius, 1982-89 (million rupee)

	Export processing	Other manufacturing	Total manufacturing	Total economy	Share of foreign investment in export processing enterprises (per cent)
1982	38	277	315	710	..
1983	74	263	337	840	..
1984	210	293	503	848	26
1985	340	400	740	1105	36
1986	560	510	1070	1435	13
1987	655	805	1460	1885	28
1988	810	855	1685	2300	28
1989	845	..	..	..	35

Sources: World Bank, *Mauritius: managing success*, 1989a; and International Monetary Fund, 'Export processing zone for growth and development: the Mauritian example', 1990.

Movement of capital out of Hong Kong was initially encouraged by rising local labour costs. But Hong Kong also relocated part of its investment in clothing to overcome import restrictions in industrial countries. An effect of the Multifibre Arrangement was thus to encourage relocation of clothing production from Hong Kong to Mauritius. The membership of Mauritius in the Lomé Conventions (known as Yaoundé Accords until 1975) provided duty free access to the EC market. Countries have free access to the US market until imports from a particular country in a particular category of clothing reach 1 per cent of US production. Few exports of clothing from Mauritius to the United States have reached this limit so that most clothing exports from Mauritius have free access to the United States market.

More recently the prospect of the return of Hong Kong to the People's Republic of China in 1997 has also encouraged the flow of capital out of Hong Kong.

Exports

Between 1970 and 1978 exports by export processing enterprises grew at an average rate of 60 per cent per annum in real terms. They accounted for 25 per cent of total exports in 1978 (Table 4). This share peaked in 1986, reaching 70 per cent.

Table 4 Export processing enterprises exports, 1978-90

	Export processing exports (US$million)	Export processing exports as a share of total exports (per cent)
1978	79	25
1979	98	27
1980	116	29
1981	122	34
1982	114	30
1983	112	33
1984	156	41
1985	212	56
1986	368	70
1987	510	63
1988	609	64
1989	594	59
1990	662	64

Source: International Monetary Fund, 'Export processing zone for growth and development: the Mauritian example', 1990 and International Monetary Fund, *International Financial Statistics*, Washington D.C., 1991.

Table 5 Export processing enterprises exports by category, 1970-89 (US$ million)

	1970-74	1975-79	1980-84	1985-89	Average annual real growth (per cent) 1980-89
Women's outwear not knitted (SITC 84112)	1	6	29	283	46.9
Men's underwear not knitted (SITC 84113)	2	20	51	278	36.0
Underwear knitted non-elastic (SITC 84143)	1	8	14	242	60.4
Outwear knitted non-elastic (SITC 84144)	8	131	230	766	12.1
Other	30	178	278	913	..
Total	43	343	602	2482	27.5

Source: International Economic Data Bank, Australian National University, 1991.

Clothing accounted for the bulk of exports from export processing enterprises, being 79 per cent between 1985-89 (Table 5). For the same period knitwear constituted the bulk of clothing exports (81 per cent). Specialization in woollen knitwear resulted in Mauritius being ranked as the third largest exporter of woollen knitwear in the world. The share of the other categories has shown little change over the years, except for knitted underwear and women's outwear which increased markedly in 1987.

Employment

By 1983 the number of employees in export processing enterprises increased to 25,520 and accounted for 67 per cent of total manufacturing employment. The growth during 1983-88 was even higher at 30 per cent per annum with employment in export processing enterprises accounting for 85 per cent of manufacturing employment and 31 per cent of total employment in 1988.

In the early years of the export-oriented policy, unemployment was as high as 21 per cent. By 1987 full employment had been achieved. Export processing enterprises also created substantial employment through multiplier effects in the informal and service sectors (World Bank 1989a).

Table 6 Growth and structure of employment in export processing enterprises, 1983-88

	1983 Number	1983 Per cent	1988 Number	1988 Per cent	Average annual growth (1983-88)
Textile yarn and fabrics	1366	5.4	3670	4.0	21.8
Wearing apparel	20453	80.1	79317	87.4	31.1
Pullovers	(14454)	56.6	(34152)	37.6	18.8
Gloves	(954)	3.7	(641)	.1	-7.6
Other garments	(5045)	19.8	(44524)	49.1	54.6
Other products	3701	14.0	7803	8.6	23.2
Total export processing	25520	100.0	90790	100.0	30.0
Share of export processing enterprises in total manufactures (per cent)	67		85	na	na

Source: A. Jeetun, 'Employment trends and training needs' *Prosi*, No. 244, Port Louis, 1989 (May).

Export processing enterprises and growth of the economy

The performance of the export processing enterprises greatly influenced the performance of the manufacturing sector and the Mauritian economy (Table 7).

During the peak growth period of 1984-88, the output of export processing enterprises expanded rapidly at a real growth rate of 30 per cent per year. The corresponding growth rate for manufacturing and the whole economy was 14 per cent and 7.2 per cent respectively (Table 7).

Table 7 Real average annual growth of output of manufactures and the economy, 1982-88 (per cent)

	Sugar milling	Export processing	Import substitution	Total manufactures	GDP
1982	19.9	-2.8	5.1	5.2	1.5
1983	-20.0	8.8	4.8	1.0	2.0
1984	-2.4	32.9	4.1	12.2	5.4
1985	20.1	30.0	3.1	15.3	6.8
1986	8.9	32.0	3.3	15.8	8.9
1987	-4.4	22.0	11.4	14.1	8.4
1988	-15.0	20.0	7.0	11.0	6.1
1984-88	1.4	29.9	5.8	13.7	7.2

Sources: Mauritius Central Statistical Office, *Digest of Industrial Statistics*, Port Louis, 1986 and Mauritius Central Statistical Office, *Annual Statistical Yearbook*, Port Louis, 1988.

The contribution of export processing enterprises to economic growth can be estimated by the share of export processing enterprises value added in gross domestic product. Domestic value added is the sum of wages, rents and profits.

Foreign ownership of export processing firms means that domestic value added is somewhat exaggerated because profits are repatriated abroad (International Labour Organization 1988; International Monetary Fund 1990). Repatriated profits, however, are a low proportion of value added, particularly in Mauritius where the bulk of export processing is domestically owned.

Table 8 Export processing enterprises value added, 1980-89

	Export processing enterprises		Share of value added by export processing enterprises in:			
			Export processing enterprises output		GDP	
	Gross domestic value added	Gross national value added	domestic gross value added	national gross value added	domestic gross value added	national gross value added
	(rupee million)		(per cent)			
1980	321	261	36	21	04	03
1981	421	338	39	31	05	04
1982	449	365	36	30	04	03
1983	548	443	42	34	04	03
1984	865	696	40	32	06	05
1985	1332	1081	41	33	09	07
1986	1900	1567	38	32	11	09
1987	2585	2116	39	32	12	10
1988	3125	2542	38	31	12	10
1989	3150	2663	35	29	11	09

Source: International Monetary Fund, 'Export Processing Zone for growth and development: the Mauritian example', 1990, Washington, D.C.

National value added, which excludes repatriated profits, provides a better estimate of the contribution of export processing enterprises to growth. As data on repatriated profits are unavailable, national value added was obtained by deducting profits accruing to foreign investors from the domestic value added. This measure of national value added understates the contribution of export processing enterprises to growth to the extent that profits of foreign owned firms are reinvested in Mauritius. Hence, the true contribution of export processing enterprises to growth lies between the two estimates.

In 1980-89 the share of domestic value added of export processing enterprises to its output was 38 per cent (Table 8). This ratio indicates that on the average, 38 per cent of export processing enterprises gross output is paid to factors of production in the form of wages, rents, interest and profits. Export processing enterprises value added contributed between 3 and 5 per cent to GDP in the early 1980s. The contribution reached 12 per cent in the late 1980s (Table 8).

The share of value added in sugar processing halved in less than a decade to 1987. The share of value added in import substitution declined almost as rapidly. The decline was taken up by value added in export processing. Export processing enterprises nearly tripled their share in value added, accounting for more than half of the manufacturing value added in the second half of the 1980s (Table 9). In spite of the rapid advance made in export processing enterprises value added share of manufacturing, however, the value added of sugar and import-substituting industries was growing in absolute terms during this period.

Table 9 Value added in manufacturing by principal category, 1977-87 (percentage share)

	Sugar milling	Tea processing	Export processing	Import substitution	Small establishments	Total manufacture
1977	30	:	19	42	10	100
1982	20	1	29	42	9	100
1983	16	2	33	40	9	100
1984	15	4	40	33	8	100
1985	15	2	47	29	7	100
1986	16	1	50	26	7	100
1987	15	1	53	24	..	100

Sources: Mauritius Central Statistical Office, *Biannual Digest of Statistics*, Port Louis, 1983; Mauritius Central Statistical Office, *Digest of Industrial Statistics*, Port Louis, 1986 and Mauritius Central Statistical Office, *Annual Statistical Year-book*, Port Louis, 1988.

The clothing industry

The bulk of export processing was in clothing which has increased its share of employment, output and exports until it has become the single most important industry in Mauritius (Table 10). As clothing is labour intensive it has become the major employer in Mauritius, accounting for 76 per cent of manufacturing employment and 30 per cent of total employment in 1988 (Table 10).

The clothing industry's contribution to exports is equally impressive. In 1988 clothing exports accounted for 78 per cent of manufacturing exports and 46 per cent of total exports.

Table 10 Contribution of clothing to the Mauritian economy, 1976-88

	1976	1983	1988
GDP at factor cost (million rupee)	4165	10613	22643
Manufacturing	669	1678	5593
Export processing enterprises	108	548	3125
Clothing	72	389	2440
Exports (million rupee)	1769	4346	13505
Manufacturing	353	1202	8318
Export processing enterprises	309	1307	8176
Clothing	205	928	6446
Employment ('000)	185	195	270
Manufacturing	28	37	106
Export processing enterprises	17	25	89
Clothing	10	21	80

Source: Mauritius Statistical Office, *Digest of Statistical Yearbook*, Port Louis, various issues and R. Alter, 'Export Processing Zones for Growth and Development: the Mauritian example', IMF Working Paper, International Monetary Fund, Washington, D.C., 1990.

Estimation of domestic factors affecting clothing exports

A partial equilibrium analysis was carried out to test the importance of various domestic factors to the export growth of labour-intensive manufactures. As the exports are predominantly clothing the impact of the domestic factors on clothing exports is analyzed for the period 1971-90. The estimation model is set out as follows:

$$\ln X_t = a \ln RE_t + b \ln RI_t + c \ln W_t + d \ln T_t + U_t \qquad 1$$

where:

X = real exports;

RE = real exchange rate;

RI = real lending rate;

W = nominal wage rate;

T = value of tariffs exemption on material inputs; and

U = error term.

The equation evaluates supply side determinants of clothing exports. Mauritius is a small supplier of clothing to the world market. It faces a perfectly elastic demand. As its export growth is not yet constrained by demand conditions, supply factors only were examined in this test.

The above equation is a very partial representation of the supply situation. It does not include political stability, the relatively well developed and competitively priced infrastructure and openness toward private direct foreign investment. The main objective was to test the importance of the effect of the exemptions from tariffs on inputs and macroeconomic stability (real exchange rate, real interest rate and relatively stable prices and hence wages) on the growth of clothing exports.

Data sources

Except for the value of tariff exemptions, the rest of the data were obtained from published sources. The concessional real lending rate of interest available to export processing enterprises was used. For instance, in 1986 the concessional credit interest rate was on the average 3.75 percentage points lower than the market rate.

The value of tariff exemptions to the clothing industry was estimated by multiplying the value of imports by the prevailing tariff rate to other users (import-substituting industries). Material and capital imports were distinguished (Forget and Corson 1983; International Monetary Fund 1990). Only tariff exemption on material inputs were considered since capital goods imports were free of tariff for all enterprises (including import-substituting ones). As a very large proportion of material imports (about 80 per cent) were textiles (yarn and cloth), the tariff rate of textiles was applied for all material inputs of clothing. Tariff rates estimates by Greenaway and Milner (1987) for 1980 (45 per cent) were applied to 1971-84. This should not bias the estimation greatly as there were no changes in the tariff system until the mid 1980s. For years since 1985 estimates from Woldekidan (1992) are used (53 per cent).

Duty free imports of material inputs to clothing exports raise the competitiveness of the industry by offsetting the direct costs imposed by protection. The clothing industry saves about 50 per cent on imported input costs due to the duty free provision.

Results

The results were as follows:

$$\ln X_t = -0.08 \ln RE_t + 0.05 \ln RI_t - 0.44 \ln W_t + 0.58 \ln T_t \qquad 2$$
$$\qquad (1.38) \qquad (0.63) \qquad (2.73) \qquad (7.5)$$

adjusted R^2 = 0.68

Durbin-Watson (DW) = 1.92

F (3, 16) =14.9

Figures in brackets are t statistics

The equation was tested for mis-specification of the functional form, serial correlation and heteroscedasticity as these may have caused problems.

The Ramesy RESET test of functional form which uses the square of fitted values as an additional regressor indicated that the functional form is not mis-specified. The test for heteroscedasticity, based on the regression of squared residuals on squared fitted values, also suggested that there was no problem of heteroscedasticity.

As the equation used time series data, the regression was tested for serial correlation. A Durbin-Watson statistic of 0.64 showed a high level of serial correlation. The serial correlation was corrected using the Gauss-Newton iterative method. After the correction the estimates of the coefficients took on the expected signs with the exception of the interest rate and the Durbin-Watson statistic increased to 1.92 (Equation 2). The interest rate coefficient was not statistically different from zero.

The coefficients appear to be of reasonable magnitudes. Conventional diagnostic statistical tests as outlined in Beggs (1988) were applied to test the adequacy of the model in explaining clothing exports. The t-tests on each of the variables indicated that the tariff exemption on material inputs was highly significant at the 1 per cent level, the wage rate at 2.5 per cent level and the exchange rate at 10 per cent level respectively. The adjusted coefficient of multiple determination (adjusted R^2) with the value of 0.68 suggests that the equation has a moderately high explanatory power. The calculated F-statistic of 14.9 exceeds the critical F-statistic value (with 3 and 16 degrees of freedom) of 5.3 at the 1 per cent level of significance. This result indicates that all the coefficients are not equal to zero.

The Chow test has been performed to test for structural stability. A test of structural change was applied to the periods 1971-80 and 1981-90. The periods were divided in this way because domestic policy changes to restructure the Mauritian economy occurred around 1981.

The calculated Chow-statistic of 0.35, is lower than the critical Chow-statistic of 5.56. Therefore the hypothesis of no structural change between the two periods is not rejected. A structural shift in the equation is not required.

The statistical results suggest that the export performance of the clothing industry was highly influenced by the tariff exemptions. Nominal wages also have a high level of significance and large magnitude. The devaluation of the real exchange rate also contributed to exports, although to a smaller extent. This is not surprising as the exchange rate was not highly distorted before the 1980s. As expected the cost of capital (interest rate) was not found to be an important factor in determining export performance.

Welfare effects of export processing enterprises

The benefits derived from the establishment of the export processing enterprises are not costless since there is an opportunity cost of allocating resources to other uses. Hence, a country's welfare is raised only if the social benefit outweighs the social cost. The welfare effects of export processing zones are theoretically indeterminate and must be left to empirical testing (Grubel 1982). One cannot establish theoretically whether export processing zones are welfare reducing or welfare raising for the countries establishing them. The welfare impact of export processing zones is based on empirical findings. Empirical studies of export processing zones in developing countries (Warr 1983, 1987; Spinanger 1984) indicate that net benefits vary. While export processing zones in Masan in the Republic of Korea (Warr 1983), Malaysia, Singapore, and Taiwan (Spinanger 1984) have positive net benefits, those in Jakarta in Indonesia (Warr 1983) and in Bataan in Philippines (Warr 1987) and Spinanger (1984) have made little contribution to the economy. The outcomes depend on the policy, investment and administrative measures used to establish and maintain the zones.

Measuring costs and benefits of export processing enterprises

The welfare gain to the economy from the presence of the export processing enterprises can be estimated by applying cost-benefit analysis. The net gain to the economy from export processing enterprises can be estimated using the net present value of the social benefits, that is, net social benefits over the life-time of the enterprises discounted by an appropriate discount rate. An appropriate discount rate is the value of capital to the economy; it can be approximated by prices charged for capital in an undistorted, competitive market. In geographically specific export processing zones, the physical investment required and used only by the enterprises in the zones is generally high. Such a cost did not occur in Mauritius.

Export processing enterprises make payments to cover costs such as wage bills, purchases of raw materials, taxes and service bills. The Mauritian economy gains if the alternative use of these resources elsewhere in the economy is lower than in the export processing enterprises.

The net economic benefit (N_t) to the Mauritian economy from export processing enterprises is formulated as:

$$N_t = (L_tW_t + M_tPM_t + E_tPE_t + R_t + T_t + P_t)\,SF_t^* - (L_tW_t^* + M_tPM_t^* + E_tPE_t^* + B_tSK_t^*) - A_t - K_t \qquad 3$$

where:

L_t	employment in year t;
W_t	wage paid in year t;
M_t	domestic raw material used in year t;
PM_t	the price paid for raw material in year t;
E_t	utilities such as electricity usage in year t;
PE_t	price paid for utilities in year t;
R_t	interest and principal repayments of domestic loans in year t;
T_t	tax paid in year t;
P_t	profit of national (Mauritian) investors in year t;
SF_t^*	the ratio of the social value of foreign exchange to the official exchange rate in year t;
W_t^*	shadow price of labour in year t;
PM_t^*	the shadow price of domestic raw material in year t;
PE_t^*	the shadow price of utilities in year t;
B_t	domestic borrowing in year t;
SK_t^*	the ratio of the shadow price of capital to its market price in year t;
A_t	administrative costs of the zone in year t and
K_t	the cost of infrastructure of the export processing zone provided by the government in year t.

Equation 3 is adopted from Warr (1990). It is modified to include the profit on national investors (P_t). National investors' profit is included in this study because local ownership of export processing enterprises in Mauritius is substantial. In the actual estimation A_t and K_t are not included due to lack of data. As a result, the net benefit will be overestimated by the amount of A_t and K_t. The overestimation, however, would not be substantial as these costs are considered not to be large.

To ease bureaucratic interference export processing enterprises are administered separately from the rest of the economy. The opportunity cost of personnel employed to run the separate administration and running costs make up the administrative cost of the export processing enterprises.

As this information is not available the administrative cost of export processing enterprises was not accounted for. As export processing enterprises are not located in a particular zone it is unlikely that large infrastructure costs are incurred to service only the export processing zone enterprises. Some factory buildings were constructed at Port Louis by the government at the early stage of establishment of export processing enterprises. Data on costs of construction are not available. It is assumed that construction costs are equal to the discounted value of commercial rents over the life of the building. The construction of the buildings incur social cost if they are rented below commercial rent. That means the social cost equals the rental subsidy. Since it was not possible to find the rental price of these buildings the infrastructure cost is omitted from the analysis.

In calculating the cost-benefit a life of 25 years is taken for the export processing enterprises, 1976-2000.

Shadow prices

The outcome of the estimates of the net gain is influenced considerably by the ratio of shadow prices to market prices. Unlike Warr (1990) where market and shadow prices were assumed to remain constant over time, they are allowed to vary over the period 1976-87 in this study (Table 11). The shadow prices vary over the period 1976-87, where applicable, because they are based on historical data.

Foreign exchange. Exchange earnings represent a social gain from export processing enterprises when the exchange rate is overvalued. Since 1981 the exchange rate regime has largely been liberalized. The shadow price of foreign exchange was hence taken to be equal to the official rate. Before 1981 due to overvaluation of the rupee, the shadow prices of foreign exchange received by the Central Bank exceeded the value of the Mauritian rupee received by enterprises at official rates. Shadow rates were calculated on the basis of successive devaluations made through time to bring the rupee to its present liberalized rate. The rupee was devalued in 1979 and 1981. Two different shadow prices, one before 1979 and another for 1979-80 were estimated relative to the rate in 1981. For instance, in 1981 the rupee was devalued by 23 per cent to get it to its current liberalized rate. Therefore, the shadow price was set at 1.23 for 1979-80 (Table 11).

Labour. Employment generation is perceived as one of the major gains in establishing export processing enterprises because the opportunity cost of workers is viewed as being below the actually received wage. The calculation of the opportunity cost of employment is, however, not straight forward. Scott (1976) estimated the social opportunity cost of 'surplus' labour as 40 per cent of the market wage rate for male and 50 per cent for female workers for 1971. He also estimated that the opportunity cost of a fully employed worker to be 80 per cent of the market wage.

This study uses Scott's estimates as its basis and allows them to vary with the rate of employment in different years: the higher the rate of employment, the higher the opportunity cost of labour. For instance, in the late 1980s when near full employment was achieved the shadow price of labour was taken to be 80 per cent of wages. Shadow prices were set lower in times of high unemployment. When there was a low employment level in the mid 1970s the shadow price of labour was set at 54 per cent of wages.

Table 11 Estimated ratios of shadow prices to market prices, 1976-2000 (per cent)

	Labour	Local material	Electricity	Domestic loan	Foreign exchange
1976	0.54	0.70	1.04	1.32	1.32
1977	0.54	0.70	1.04	1.32	1.32
1978	0.64	0.70	1.04	1.32	1.32
1979	0.69	0.70	1.04	1.32	1.23
1980	0.74	0.70	1.04	1.32	1.23
1981	0.69	0.70	1.04	1.32	1.00
1982	0.64	0.70	1.04	1.32	1.00
1983	0.54	0.70	1.82	1.32	1.00
1984	0.59	0.70	1.82	1.32	1.00
1985	0.66	0.70	1.82	1.32	1.00
1986	0.77	0.80	1.82	1.32	1.00
1987	0.80	0.80	1.82	1.32	1.00
1988	0.80	0.80	1.82	1.32	1.00
1989	0.80	0.80	1.82	1.32	1.00
1990	0.80	0.80	1.82	1.32	1.00
1991	0.80	0.80	1.82	1.32	1.00
1992	0.80	0.80	1.82	1.32	1.00
1993	0.80	0.80	1.82	1.32	1.00
1994	0.80	0.80	1.82	1.32	1.00
1995	0.80	0.80	1.82	1.32	1.00
1996	0.80	0.80	1.82	1.32	1.00
1997	0.80	0.80	1.82	1.32	1.00
1998	0.80	0.80	1.82	1.32	1.00
1999	0.80	0.80	1.82	1.32	1.00
2000	0.80	0.80	1.82	1.32	1.00

Note: Ratios between 1988 and 2000 are set at the same rate as 1987.

Domestic material inputs. Usage of domestic material was negligible. The opportunity cost of domestic material inputs used by export processing enterprises was taken as the price of similar imported goods (c.i.f. price). The opportunity cost c.i.f import price is lower than the market price by the amount of duty. The use of domestic material inputs in the export processing enterprises has, thus, a welfare gain.

Domestic loans. Export processing enterprises loans accounted for 27 per cent of commercial banks lending in 1989. Export processing enterprises are given a subsidy on loans from domestic sources. They are charged a lower rate of interest than the market rate. Assuming that there are no significant distortions in the non-concessional rate, the non-concessional rate closely reflects the opportunity cost of capital. The opportunity cost of domestic finance is higher than its market prices in export processing enterprises. The use of domestic finance in export processing enterprises has, thus, a welfare loss to the Mauritian economy.

Electricity. Export processing enterprises are given concessions on their electricity rates. Assuming that the non-concessional rate approximates the opportunity cost of electricity the actually paid electricity bill is lower than its opportunity cost by the value of the concession. Electricity use in the export processing enterprises has a negative welfare effect similar to the use of domestic finance.

Net gain

The welfare impact of export processing enterprises is presented in Table 12. All columns, except the last, represent two components.

- The difference between the value of the factor at market price and at shadow price. A positive value indicates a welfare gain because the use of the factor in the export processing enterprises at market prices has a higher value when that factor is valued at its shadow price. A negative value indicates a welfare loss for the same reasoning.
- A gain from exchange earnings. Export processing enterprises need to convert foreign exchange earnings into Mauritian rupees to employ local workers, to pay off domestic loans, to purchase domestic raw materials and services from the domestic economy. An overvalued currency means that foreign exchange received by the Central Bank is higher in rupee terms than the enterprises are given in exchange. The gain from exchange earnings because of the use of these factors is obtained by multiplying the difference between the social value of foreign exchange and the official exchange rate by the market value of the factors.

Table 12 Welfare impact of export processing enterprises: net present value, 1976-2000 (million rupee)

	Employment	Local material	Electricity	Tax revenue	Domestic loan	Profits
1976	70.0	2.5	1.0	-	0.1	17.6
1977	81.7	2.9	1.2	-	0.1	20.5
1978	66.1	2.7	1.1	-	0.1	19.1
1979	56.5	2.5	0.8	-	-14.8	19.0
1980	61.7	3.0	0.9	-	-13.9	22.9
1981	40.0	1.7	-0.2	-	-46.7	18.8
1982	43.1	1.6	-0.2	-	-46.7	17.8
1983	50.4	1.5	-3.5	-	-52.3	16.3
1984	74.1	2.5	-5.9	-	-68.8	17.9
1985	80.0	3.2	-7.7	11.2	-76.5	23.2
1986	70.0	2.8	-9.9	14.5	-85.0	26.2
1987	81.0	3.7	-13.1	19.2	-103.6	34.6
1988	72.9	3.3	-11.8	17.3	-93.3	31.2
1989	65.7	3.0	-10.6	15.6	-84.0	28.1
1990	59.1	2.7	-9.6	14.0	-75.6	25.3
1991	53.2	2.4	-8.6	12.6	-68.1	22.8
1992	47.9	2.2	-7.8	10.4	-61.3	20.5
1993	43.2	2.0	-7.0	10.2	-55.2	18.4
1994	38.9	1.8	-6.3	9.2	-49.7	16.6
1995	35.0	1.6	-5.7	8.3	-44.8	15.0
1996	31.5	1.4	-5.1	7.5	-40.3	13.5
1997	28.4	1.3	-4.6	6.7	-36.3	12.1
1998	25.5	1.2	-4.1	6.0	-32.7	10.9
1999	23.0	1.0	-3.7	5.5	-29.4	9.8
2000	20.7	0.9	-3.3	4.9	-26.5	8.8
NPV	1319.1	55.2	-123.9	174.4	-1205.3	487.0

Further, locally owned enterprises earn foreign exchange to the domestic economy through their profits (Table 12, column 6). It is assumed that Mauritian nationals earn profits in proportion to their equity capital. Substantial parts of the equity capital (47 per cent between 1976 and 1983, 31 per cent between 1983 and 1985 and 27 per cent between 1984 and 1985 (Lamusse 1989)) in the export processing enterprises were owned by local entrepreneurs. Therefore, exchange earnings on profits are obtained by multiplying the profits accruing to local owners by the ratio of the social value of foreign exchange to the official exchange rate.

The entries in each of the five columns are obtained by discounting back the economy's net gain or loss resulting from the export processing enterprises. The market interest rate is used as the nominal discount rate. The market interest rate varied between 15.5 and 20 per cent. Nominal rather than real discount rates are applied because the costs and benefits of each year are at current rather than at constant prices.

The tax revenue column in Table 12 is zero until 1985 because export processing enterprises did not pay tax before 1985. Until the mid 1980s export processing enterprises were exempted from corporate income tax for 10 to 20 years. Since 1985 they have paid 15 per cent income tax throughout their productive life. As more than 90 per cent of the 563 companies operating in 1989 started operations after 1974, corporate income tax in this exercise is calculated from 1985. Corporate income is estimated from the tax rate and the share of gross operating surplus in output in the 1987 input-output table. As there are no data on the breakdown of gross operating surplus it was divided between profits and returns to capital by a two to one ratio.

The net present value (NPV) row shows the benefits and costs of the presence of the export processing enterprises over the years 1976-2000 (Table 12). The presence of enterprises has benefited the Mauritian economy through employment generation, profits to locally owned enterprises, tax revenue and usage of local material.

The largest gain occured from employment generation with 1.3 billion rupees. The second largest gain of 487 million rupees is obtained from profits to locally owned enterprises followed by 174 million rupee of tax revenue. The gain from usage of local material is modest with 55 million rupee.

Much (90 per cent) of the overall gain of the 2 billion rupee originated from the direct contribution of the factors, such as the use of labour whose opportunity cost is below the actual wage. The remaining 10 per cent represents a gain in foreign earnings due to the overvaluation of the rupee in the second half of the 1970s.

Some of the gain is offset by concessions on domestic loans and electricity rates. The highest cost of 1.2 billion rupee is incurred by concessions on domestic loans, concessions on electricity rate taking only one-tenth of the amount.

Overall the presence of export processing enterprises resulted in a net gain to the Mauritian economy. This net gain is estimated to be 706 million rupee over the period 1976-2000. At 1976 prices this amounts to 9 per cent of GDP, a substantial contribution from an industry.

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