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AN ECONOMETRIC ANALYSIS OF THE DETERMINANTS OF MALTESE EXPORTS OF MANUFACTURERS

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WORKING PAPERS

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INTRODUCTION

1) Aim of the Research

The aim of this Paper is to provide estimates of the demand function for Maltese Exports of Manufactured Goods. It is argued in the Paper that estimates of price and income elasticities depend on the supply response. Most of the previous econometric work has by and large neglected the supply-side of exports and estimated a demand equation only. This assumes supply of exports to be infinitely elastic, which might not be the case. Moreover, single-equation estimation of a relationship which is only a part of a larger system can lead to simultaneous equation bias and inconsistent estimates. In fact many of these studies have yielded relatively low price elasticities and high income elasticities of demand. Elasticity estimates for Industrial countries carried out by Houthakker and Magee (May 1969), were found to be highly significant for income with a numerical magnitude between 1 and 3 while the estimates for the price elasticities turned out to be insignificant. The reason for this given by Houthakker and Magee themselves are simultaneous-equations bias and inadequacies of export price indices. Significant price elasticities for some non-industrialised countries were also obtained with a magnitude varying between 0.4 to 1.3 while the income elasticity estimates were all highly significant with a value of 0.34 to 2. At 4, the income elasticity for Israel was considered exceptionally high. The low income elasticities faced by these countries were related by the authors to emphasis on "unpromising products such as coffee".

It has become the conventional belief that the growth of output in the developing world depends on the growth rate of output in the developed world - when the developed countries grow fast so do the developing, while if the developed countries suffer a decline in their economy, the rest of the world economy slows down (Lewis: 1980), particularly through the effect of real income growth in the developed countries on the growth of exports of non-oil developing countries, (Goldstein and Khan: 1982; Briguglio: 1985). It is also believed that the smaller and the more open an economy is, the more vulnerable it is to foreign economic fluctuations.

ii) Justification

It has been argued - conceptually as well as on the basis of empirical work - that the Maltese economy in general and exports in particular, are highly sensitive to economic conditions abroad, (Briguglio: 1989), with price elasticity estimated at -3.79 and foreign income elasticity for Maltese exports at 6.1. These results mean that for a 1% rise in prices the Maltese economy loses 3.8% of its exports, while they experience a 6% change with a 1% change in the "World Economy". The same argument was put forward by Scicluna (Dec 1988), whose estimates however, are different, in magnitude, from those of Briguglio, the price elasticity being -2.37 and the income elasticity 1.46. Both authors used production of principal European Trading partners as a proxy for income. These estimates were also the result of single-equation estimation.

The above results however show that other factors in addition to the "world" income may affect exports, for instance the domestic price of exports and the price of competitive commodities abroad. If income in the "receiving" countries, ie the importers of Malta's exports, is the determinant or the most significant determinant of the volume of Maltese exports, then variations in "world" income (ie economic recessions and recoveries) matter to such an extent that Maltese export performance is tied to what happens outside of the domestic economy or more precisely in the buyer countries of Maltese exports. If such is the case very little could be done on the supply side since volume of exports would be exogenously determined and so would the price. If however, due to the small country condition, the share of Maltese exports in total imports of the buyer countries - Malta's clients - is negligible then what matters most is the price of Maltese exports. This can be looked upon from two different points of view (a) the price itself and (b) the price in relation to the price of competitive goods. In fact, the most interesting factor with regards to exports is the relative price because since exports cross borders, it is their price in relation to international prices which matters most: it is the price of Maltese exports in relation to that of Malta's competitors which places Maltese exports on a competitive edge or not over those of competitive countries. Once this competitive position for Maltese exports is assured, then quantity depends on supply and hence the supply side cannot be neglected any more. Once Maltese export-competitiveness is well established, then, even if there is some pressure

on demand due to economic conditions abroad, export suppliers may adjust their production (quantity and prices) as a shield against foreign pressures. An export-supply function then must be introduced as part of the model which explains Maltese Exports.

It is argued in this paper that Maltese exports may not be so highly sensitive to foreign income because of supply response. Producers may adjust their prices to regain a competitive edge in response to changes in the foreign prices of exports as well as to competitors' actions. Even in the event of international recessions, domestic producers may take some measures so that the adverse effects need not turn out to be as drastic as one would expect from a "small" country where prices are "fixed" outside the domestic economy. Moreover, Selwyn argues that a micro-state has a considerable advantage that its output is too small to cause distortions in the international system so that its actions need not necessarily be restricted by the possible retaliation of competitors, (Selwyn, D: 1975). If what has been said in this paragraph holds true for Maltese exports of manufactures, then the *a priori* assumption of infinite exports supply elasticities becomes less justified.

iii) Methodology and Organisation of the Paper

In this paper I will try to investigate to what extent the price and income elasticities for Maltese Exports are affected by misspecification due to simultaneity bias by dropping the assumption of infinite elasticity of supply and introducing a separate supply equation in the model proposed for the estimation of export demand elasticities. This can be done in virtue of the supply response in the Maltese manufacturing sector.

Establishing the determinants of Maltese Exports of manufactured goods is not only important from an econometric point of view but also because it affects government's policy vis-a-vis export-related measures in order to safeguard what has been achieved so far in this sector and to enhance its performance because exports of manufactures are of vital importance (in terms of income, employment and foreign exchange earnings) for a small, open economy of Malta.

This Research Paper starts with an overview of the Maltese export sector. It will show how over a span of fifteen years (1962-1976) the ailing manufactured-export sector of the early sixties has grown to become one of today's major sectors of the economy. Such an importance calls for thorough investigation into the determinants of Maltese exports. This will be done by econometric analysis. **Chapter 2** will review some models regarding exports of manufactures while a model for Maltese Exports of manufactures will be proposed. However, the "best" Model shall wait until a later part of the Research (**Chapter 4**) after several estimations and diagnostic tests will be conducted. **Chapter 3** will deal with the collection and organisation of the data used in this Research Paper. It will also explain the derivation of the model variables encountered in this Paper. **Chapter 4** concerns the estimations of the models for Maltese Exports of Manufactures. Various models will be estimated and tested for plausibility and simultaneity bias. Upon the results of such estimations, the "Best" or rather the more suitable model for Maltese Exports will be chosen. Analysis and implications of the estimates will be covered in the last part of this Chapter. The last part of the Paper will summarise the findings of the Research.

CHAPTER 1

EXPORTS PERFORMANCE

1.1 Introduction

This Chapter will show the importance of Exports of Manufactured Goods to the Maltese economy and hence the importance to estimate its determinants appropriately.

1.2 Export-Oriented Industrialisation

Until the 1950s, Malta - then a British Colony[1] - had a fortress economy. Nearly all the income and employment depended on the UK Government[2] (Balogh & Seers: 1955). Other problems included a rising budget deficit and a population growing at a faster rate than the food supply, so that Malta became increasingly dependent on imported food. It was the objective of successive development plans to remove the concept of a fortress economy and to build a new economic structure based on Manufacturing and Tourism, with emphasis on the former. Aid to Industry was legalized in 1959; inducements to attract foreign investment and the provision of adequate infrastructural facilities were essential for industrial development and funds were made available for such projects.

Export-Oriented Industrialization policies featured prominently in the Maltese economy since the onset of the First Development Plan[3] - even during a period ('70s and early '80s) when the administration favoured Import-Substitution, (Pomfret: 1986). In fact Malta's was an interventionist approach to the import sector coinciding with an export-led growth strategy. The importance of exports and the role of foreign investment in promoting exports of manufactures was a sine-qua-non in a micro-state like that of Malta where the smallness of the domestic market, and hence lack of economies of scale, constrain the small

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[1] Malta was granted independence from Britain in 1964.

[2] Appendix 1.1 shows the net output and employment by Broad Economic Sector between 1955 and 1990.

[3] Following the advice of Balogh and Seers who were appointed by the Maltese Government to advise on possible financial aid by Britain and to make a general survey of the Maltese economy, the Maltese Government drew up a Plan which was neither published nor legalised.

country into export orientation. Due to lack of resources and an insignificant agricultural sector, Maltese exports consist mainly of manufactured goods.

TABLE 1.1

MALTA: Commodity Breakdown of Exports (1982-1990)
(Lm million)

Domestic Exports	1982	1984	1986	1988	1989	1990	1991	1992
Food	2.8	5.2	4.6	5	5	4.7	5.6	8.0
Beverages & Tobacco	5.7	5.7	4.9	2.6	2	2.3	2.6	1.8
Crude Materials	1.2	1.7	1.2	2	2.5	2.1	1.2	1.3
Chemicals	1.1	1.4	2.4	2.5	3.1	3.9	6.2	8.6
Semi-Manufactures	17.5	18	20.2	25	28	29.7	29.0	31.5
Mach. & Trans Equipment	19.4	33.5	45	83.6	137.1	174	216.0	274.6
Other Manufactures	102.5	99.2	102	96.4	95.9	112	111.4	125.6
Total Dom Exports	150.1	164.8	180.3	217.1	273.6	328.7	372.0	451.5

Source: Economic Survey, 1993, DOI, Malta

Table 1.1 shows the commodity breakdown of Maltese domestic exports between 1982 and 1992. Semi-Manufactures, Machinery and Transport Equipment and Other Manufactures account for more than 90 % of domestic exports. It also highlights the importance of Machinery and Transport Equipment (mainly micro-electronics) and how this sector grew to become the leading export sector responsible for over 50% of total domestic exports in 1990 and exceeding 60% by 1992.

1.3 Structural Changes in The Maltese Economy

The structure of the Maltese economy in the fifties was quite different from what it is at the present. **Table 1.2** compares the net output and employment of broad economic sectors in 1955 and 1990. It shows structural changes in three major sectors of the Maltese economy: the British Military Services, Manufacturing and Government. The British Military Base left Malta in 1979 and so did its servicing. Manufacturing and the Public Sector largely absorbed the jobs lost by the British Services and contributed significantly towards the GDP. As one might expect such changes have occurred gradually though with some short-term fluctuations. **Appendix 1.1** shows the yearly changes in net output of broad economic sectors while **Appendix 1.2** shows employment shares. 5-Year averages are shown in **Table 1.3.**

TABLE 1.2

MALTA: Net Output and Employment by Broad Economic Sector as a Percentage of GDP at fc (1955 and 1990)

	Net Output		Employment**	
	1955	1990	1955	1990
Manufacturing	8.3	27.0	10.1	22.9
Const. & Quarry.	8.4	3.5	5.7	4.2
Market Services	33.3	35.6	25.4	26.9
Agric & Fisher.	5.7	3.5	10.3	2.5
Government*	13.1	22.5	19.6	37.0
Brit. Milit. Ser.	24.9	-	28.9	-
Property Income	6.4	7.9	-	-

* Includes Companies with Public Sector Majority Shareholding of which: Direct Production: 4254 (3.3% of GOP) Market Services: 6176 (4.9% of GOP)

**8291 (6.5%) in temporary employment: Apprentices, Pupil Workers, Student Workers, Trainees, etc.

Source:National Accounts for the Maltese Islands and Econ Surveys, Malta, various issues.

TABLE 1.3

MALTA: GDP at factor (current) cost by Broad Economic Sector
Average percentages for 5-yearly sub-periods

Year	Manuf	Const. Quarr.	Mkt Serv.	Agric.& Fisher.	Govt.	Brit Mil.Ser.	Prop Inc	GDP at fc	Total %
1955-1959	9.98	8.31	34.79	6.37	12.65	22.20	5.70		100
1960-1964	16.53	6.44	32.61	7.39	15.80	16.08	5.15		100
1965-1969	20.77	6.17	33.33	7.24	18.02	9.50	4.98		100
1970-1974	24.27	5.70	30.17	7.18	20.48	6.30	5.90		100
1975-1979	32.72	5.05	30.88	5.27	17.69	2.34	6.03		100
1980-1984	30.50	5.10	33.72	4.28	19.00	0.00	7.40		100
1985-1989	28.12	4.16	34.13	4.17	21.67	0.00	7.74		100
1990	27.04	3.52	35.63	3.47	22.49	0 .00	7.85		100

Source: National Accounts of the Maltese Islands, COS, various issues.

Table 1.3 and **Chart 1.1** reveal the progressive phasing out of the British Military Services by 1979 and how other sectors responded to this.

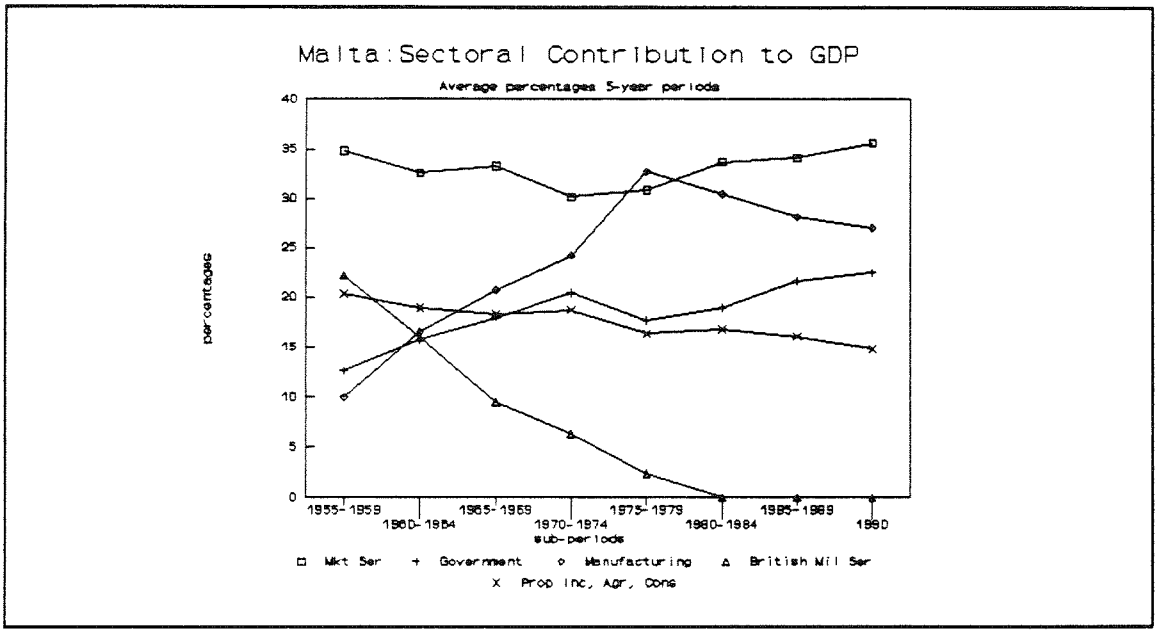

CHART 1.1

1.3.1 The Public Sector

The Public Sector, including Public Enterprises, has shown a steady increase from the 1950s to the early 1970s (from 12% to 21%), responding to the infrastructural and administrative needs of the country. During the 1970s, it lost some % points due to "belt-tightening" policies. However, since the late 1970s, after the closure of the British Military Base, Government's share in GDP started to increase again, along with the Market Services Sector, to absorb what was being lost by the other Sectors, namely the Military Services and Manufacturing. This situation dragged to the late 80s when measures were taken to boost the Market Services Sector as well as the Manufacturing, through liberalization, the main concern being competitiveness of Maltese exports on the International Market.

1.3.2 Market Services Sector

Market services registered a gradual decline since the 50s to the mid-seventies and then were boosted by several policies undertaken by the administration, especially trade liberalization, in the mid-eighties especially as regards Trade, Offshore Services and Tourism so that the share in GDP has again reached that in the 1950s ie 35 %.

1.3.3 The Manufacturing Sector

Manufacturing output has seen a 100 % increase in the share in GDP between 1958 and 1959 (refer to **Appendix 1.1**), when manufacturing was highlighted in the first Development Plan for Malta and when incentives to Industry started to be conceded. Since then it has grown steadily (except for minor fluctuations, up to 1979 and then started to lose some of its healthy shape in the beginning of the eighties to regain it towards the nineties. The main reasons were the excessive government intervention in the economy - with its entrepreneurial role and ISI strategy of the late 70s and early 80s as well as loss of export competitiveness (Scicluna: 1993).

1.3.3.1 Export Performance

Within the Manufacturing Sector, export-oriented industries showed the greatest expansion as shown in **Appendix 1.3.** Together with **Table 1.1** it also shows that over the years, the composition of Maltese Exports changed as well for instance, it shows that Machinery has established itself as the leading export sector while the Textiles Sector lost its vitality.

Table 1.4 shows the growth of Maltese exports over the period 1960 - 1990. Between 1960 and 1969 exports of manufactures grew from 3.83 million to 15.96 million Maltese pounds (later called Liri), which means a simple annual average increase of 35% or 18 % compounded per year. The share of exports to GDP over the same period rose from 0.08 to 0.19. The seventies recorded a 94% average annual growth rate of manufactured exports - from 16.0 million pounds in 1970 to 152.17 million in 1979 so that the share of manufactured exports to GDP also rose steadily but at a faster rate than in the previous decade, to reach 0.51 by 1977 and down to 0.47 in 1979. Graphical representations of these shares and trends are shown in **Charts 1.2** and **1.3**

Pomfret, (1986), associates the better performance in exports in the seventies, at least in part, with the Association Agreement of 1970 between Malta and the EC which granted trade preferences to Maltese exports. Yannopoulos, (1986), reiterates that such trade preferences generated export-expansion effect through increased foreign direct investment, which, due to Malta's very small internal market, was export oriented.

TABLE 1.4

MALTA: Exports of Manufactures and Their Share in GDP(1960–1990) (Lm million)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Value of Exports (cur pr)	3.83	4.65	4.32	5.27	6.92	8.65	10.75	9.89	14.15	15.96	16.07	18.82	25.72	35.96	51.58	63.9
GDP (curr pr)	48.1	50	48.6	48.2	49.2	52.7	58.8	63.7	71.3	82	94.8	97.8	102.2	115.7	131.6	165.8
Ratio of Exports to GDP	0.08	0.09	0.09	0.11	0.14	0.16	0.18	0.16	0.20	0.19	0.17	0.19	0.25	0.31	0.39	0.39
Rate of Exports Growth (curr pr)		21.41	-7.10	21.99	31.31	25.00	24.28	-8.00	43.07	12.79	0.69	17.11	36.66	39.81	43.44	23.89
Rate of GDP Growth (curr pr)		3.95	-2.80	0.82	2.07	7.11	11.57	8.33	11.93	15.01	15.61	3.16	4.50	13.21	13.74	25.99
Gross Manufacturing Output	13.2	12.1	13.1	14.6	16.7	19.41	21.9	24.2	29.8	35.1	38.8	41	48.7	65	82.4	98.7
Total Exports of Goods and Services	28.7	29.1	26.4	25.9	27.2	28.4	33.4	33.3	40.8	46.5	47.1	50	53.4	75.3	110.4	137.3
Share of Man Exp in Gross Man Out	0.29	0.38	0.33	0.36	0.41	0.45	0.49	0.41	0.47	0.45	0.41	0.46	0.53	0.55	0.63	0.65
Share of Man. Exp in Tot Exp of G & S	0.13	0.16	0.16	0.20	0.25	0.30	0.32	0.30	0.35	0.34	0.34	0.38	0.48	0.48	0.47	0.47
Exports Value Index	na	na	na	32.44	33.80	34.70	33.90	32.60	35.00	36.40	40.90	40.20	44.70	49.40	62.70	66.70
Exports Volume Index	na	na	na	8.30	9.10	10.60	13.40	13.00	17.40	20.40	17.40	22.30	28.60	38.30	40.20	44.80
Value of Exports (85 prices)				16.25	20.47	24.93	31.71	30.34	40.43	43.85	39.29	46.82	57.54	72.79	82.26	95.80
Rate of Growth of Exports (85 prices)					26.03	21.76	27.21	-4.33	33.26	8.45	-10.39	19.15	22.91	26.51	13.01	16.46
GDP (85 prices)	100.1	99.40	95.10	94.90	96.90	103.60	114.80	122.70	135.10	143.80	162.00	165.90	175.60	192.80	212.10	253.60
Rate of Growth of GDP (85 prices)		-0.70	-4.33	-0.21	2.11	6.91	10.81	6.88	10.11	6.44	12.66	2.41	5.85	9.79	10.01	19.57

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Value of Exports (cur pr)	97.41	121.79	131.95	152.17	166.72	173.73	169.04	156.75	181.36	187.1	194.67	208.59	235.92	294.41	358.2
GDP (curr pr)	203.7	239.8	277.6	325.8	392	436.5	461.8	457.6	461.1	476	511.9	549.2	606.5	670.1	734.9
Ratio of Exports to GDP	0.48	0.51	0.48	0.47	0.43	0.40	0.37	0.34	0.39	0.39	0.38	0.38	0.39	0.44	0.49
Rate of Exports Growth (curr pr)	52.44	25.03	8.34	15.32	9.56	4.20	-2.70	-7.27	15.70	3.16	4.05	7.15	13.10	24.79	21.67
Rate of GDP Growth (curr pr)	22.86	17.72	15.76	17.36	20.32	11.35	5.80	-0.91	0.76	3.23	7.54	7.29	10.43	10.49	9.67
Gross Manufacturing Output	132.1	165.4	181.3	212.1	243.6	252.2	257	255	292	304	327.1	346.5	385.2	446.1	518.9
Total Exports of Goods and Services	172.7	207.4	229.6	290.8	356.6	355.9	319.8	307.6	323.5	345.2	365.7	429.6	480	543.5	626.4
Share of Man Exp in Gross Man Out	0.74	0.74	0.73	0.72	0.68	0.69	0.66	0.61	0.62	0.62	0.60	0.60	0.61	0.66	0.69
Share of Man. Exp in Tot Exp of G & S	0.56	0.59	0.57	0.52	0.47	0.49	0.53	0.51	0.56	0.54	0.53	0.49	0.49	0.54	0.57
Exports Value Index	74.30	77.10	83.80	90.50	94.50	101.30	104.30	98.00	99.70	100.00	102.50	107.40	118.80	124.30	na
Exports Volume Index	63.90	80.10	83.00	89.70	93.60	92.30	85.30	85.50	97.70	100.00	104.40	105.40	108.40	130.40	na
Value of Exports (85 prices)	131.10	157.96	157.46	168.14	176.42	171.50	162.07	159.95	181.91	187.10	189.92	194.22	198.59	236.85	
Rate of Growth of Exports (85 prices)	36.85	20.49	-0.32	6.79	4.92	-2.79	-5.50	-1.31	13.73	2.86	1.51	2.26	2.25	19.27	
GDP (85 prices)	296.70	332.90	370.00	408.90	437.70	452.20	462.50	459.70	464.00	476.00	494.50	514.80	558.10	603.80	
Rate of Growth of GDP (85 prices)	17.00	12.20	11.14	10.51	7.04	3.31	2.28	-0.61	0.94	2.59	3.89	4.11	8.41	8.19	na

Sources:IFS Tables various issues, and Yearbooks,Census of Indus Production, COS, Malta, Economic Surveys, DOI, Malta.

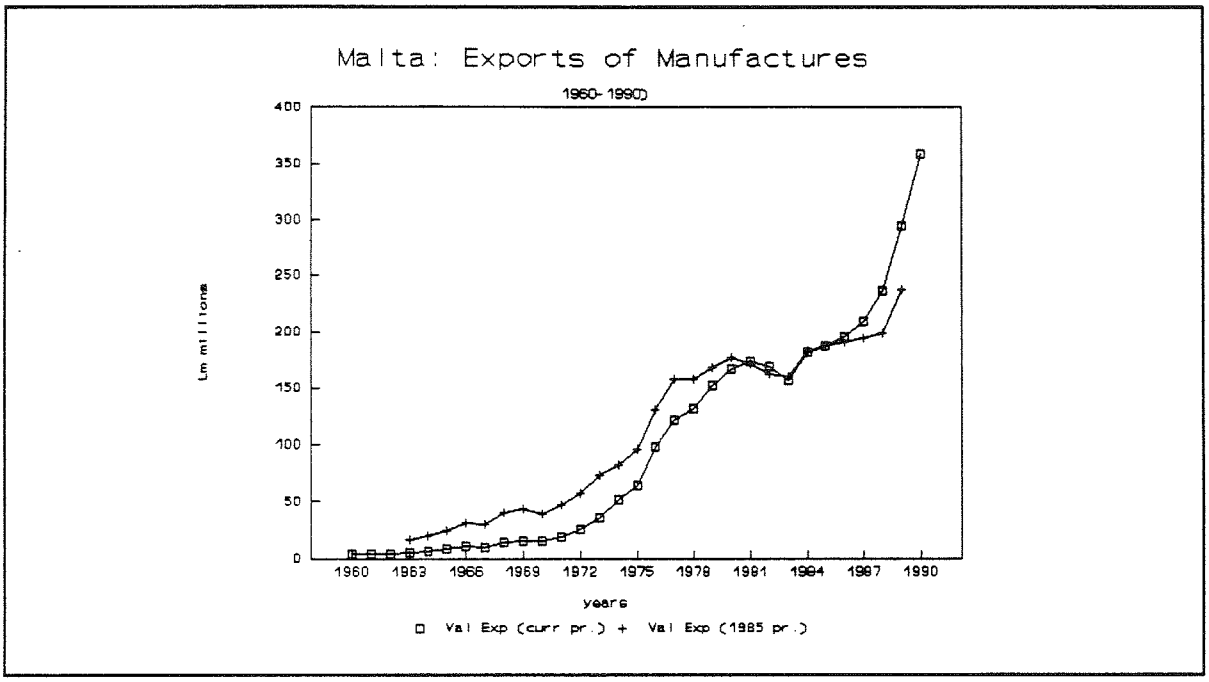

CHART 1.2

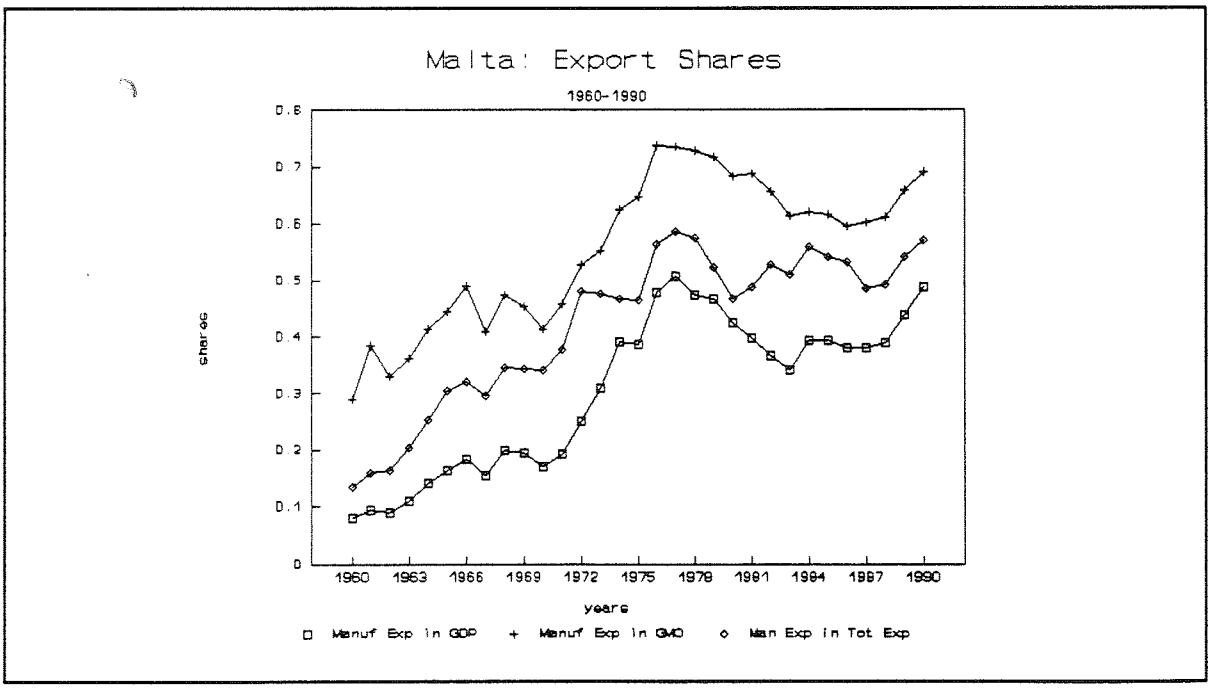

CHART 1.3

Pomfret supports his view by the fact that 3/4 of Maltese exports went to the EC. **Table 1.4** also shows that except for some years, exports of manufactures at current prices showed a positive rate of growth which amounted to 17 % per year. At 1985 prices, 1970, 1978 and 1981 registered a negative growth rate as well but the annual growth at constant prices, at 15 % is still a very high one. Of course, over a period of 30 years one cannot expect the absence of short term fluctuations due to a variety of factors.

The share of exports of manufactures in total exports of goods and services started to lose some of its vitality after 1977 (0.59) until 1980 (0.47). It recovered over the period 1981 to 1984 with the share reaching 0.56. There was another decline over the period 1985 until 1987 (0.49), but thereafter started improving again to reach 0.57 by 1990. It covers between 60% and 70% of Gross Manufacturing Output with some short term fluctuations. This reflects the importance of manufactured exports for foreign exchange earnings and employment in the micro-state of Malta which is scarce of natural resources. These conditions make the economy of Malta extremely open and therefore exposed to, and affected by, many factors. The manufacturing sector in particular, has been affected by several factors: different trade strategies, ISI, EOI, mixed economy, government intervention to sustain such strategies for instance concessions to certain industries, protection, provision of infrastructural facilities, direct foreign investment, liberalization, economic treaties and labour relations. To these one may add foreign factors like economic recessions and foreign competition which, more or less might have affected the domestic economy.

1.4 Conclusion

All such factors were important to make Malta's Manufacturing sector in general and the export sector in particular, a success story. It is the aim of this research to analyze - using econometric tools - the effects of various factors on the exports of Maltese manufactures. More concretely, a search for the best model for the determinants of Maltese exports of manufactured goods will be made and tested within the prevailing limitations. These center around data availability and unquantifiable variables - if necessary proxies and dummy variables will be used. Another major limitation is the time constraint within which this research must be undertaken.

The Study will be based on an econometric model of the demand for and supply of exports using a model similar to that used by Houthakker and Magee (May 1969) and Mohsin Khan (1974), and the procedure used by Riedel (1988). It shall be established whether demand for Maltese manufactured exports is determined by a single equation or by a more complex, simultaneous equation model and what would the effect of such simultaneous estimation be on the price and income elasticities.

CHAPTER 2

THE MODEL

2.1 Introduction

The core of this Research Paper centres around finding what determines the demand for Maltese Exports of Manufactured Goods. Moreover, it is argued that the supply side should not be neglected but should feature explicitly in estimating the demand factors. Therefore in this Chapter, before proposing a model for Maltese exports of manufactures, I shall introduce Demand and Supply theories of exports of manufactures. In so doing I shall review some of the common functions and models found in the literature and then propose a working model for Maltese Exports.

2.2 Demand and Supply of Exports

Demand and supply of exports can be treated as that for normal goods. However, since exports cross borders, some of the variables affecting demand and supply of a normal good, particularly those involving prices, need some adjustment. Moreover, the supply-side of LDCs exports has generally been neglected for the simple reason that it is difficult to model properly. The main reason behind this is that some of the determinants of exports supply are unquantifiable and therefore difficult to measure, (Riedel: 1988). These issues will be dealt with in the following sections.

2.2.1 The Demand-Side Determinants of Exports

Demand for manufactured exports is generally affected by prices. However, since exports are destined to cross borders, **relative** prices become the significant element. According to many economists as well as from a policy perspective, relative prices are the most intriguing determinant of export performance (Winters: 1981; Briguglio: 1989). The exchange rate between the exporting country and the rest of the World, or rather the trading partners, as well as local currency prices of exports and the foreign price of competing exports on the world market should therefore feature prominently in the demand equation for exports. The relative price of Maltese exports is a composite of the exchange rate of the Maltese currency and the ratio of Maltese export prices to those of "competitor" countries. This composite variable would therefore capture the effect of devaluation on the volume of exports via price competitiveness. The

price of exports is also expected to be affected by prices of imported inputs because the import content of Maltese exports is around 50%. Measures which raise the price of intermediate imports would induce a rise in the price of exports. Empirical Studies (Dornbusch and Krugman: 1976 and Bruno: 1978) amongst others (cited in Brakman: 1991), concluded that import price changes would also have a considerable effect on domestic prices. Even more so in Malta where imports of goods and services almost equalled its GDP while import content of private consumption is around 45%. If domestic prices rise, it would be of detriment to export competitiveness since relative prices of Maltese exports would become higher than those of competing countries - if prices in these countries do not change at least as much as in Malta. If however the prices of intermediate imports of Malta's competitors go up, then Malta would gain a competitive edge over those countries.

Demand for a commodity is generally influenced by disposable income of consumers. The higher the income the more consumers would like of a particular good. Demand for exports has also been linked to the "income" of "Buyers". However, disposable income is substituted by the level of economic activity or demand conditions in export markets. This could be approximated by real GDP. Some authors (Scicluna: 1984 and Briguglio: 1989), use industrial output in "client" countries as a proxy for this. Winters L A (1981), Houthakker H S and Magee S (1969), Khan M S (1974), Briguglio P L (1989) and other authors strongly believe that exports of manufactures from developing countries are affected by the level of income in buyer countries. Some have also supported their hypothesis by empirical evidence.

Price controls on goods produced in "buyer" countries in periods of rising aggregate demand can also affect demand for imported goods. Riedel (1989) argues that such price controls would shift demand from domestic to imported goods (ie other suppliers' exports). The removal of price controls allow producers to raise their prices and increase supply. This would shift the import demand function downwards which results in both a lower price and lower volume of imports.

Winters L A includes the Capacity to Import as another variable which influences the level of economic activity in importing countries since, he argues, importers must find the means of payment which might be a problem for some potential buyers. However, it is not expected that this is an influential variable in the case of Maltese exports since 90% of Malta's exports are directed to developed countries[4] which due to an efficient capital market, capacity to import constraints are negligible.

Non-price determinants of demand for manufactured exports are varied and may depend on many factors including bilateral agreements and protocols. Almost invariably, Trade Reciprocity Agreements always favoured Malta's trade balance with the other signatory. However, trade based on such terms may distort the price relationship because such agreements might compel the trading partner to buy a certain amount of its needs at less than competitive prices to honour its commitment. An element of Malta's exports to certain countries, for instance Italy, is also tied to financial agreements, whereby it agrees to buy a certain amount of its imports needs from Malta. Although such traded goods form part of Malta's exports of manufactures, it is not - to say the least - fully explained by prices and other quantifiable determinants.

Traditionally, therefore, the main explanatory variables for the Demand for exports include relative prices and an activity variable of the world.

2.2.2 The Supply-Side Determinants of Exports

Generally, the Supply of exported goods depends on their price, and on the production costs ie material inputs and wages (and other overhead costs). It is assumed that export supply is influenced also by installed capacity or rather by domestic capacity utilisation. The variable relating to capacity utilisation is therefore intended to capture the effect of supply constraints on exports. In the absence of data relating directly to Capacity Utilisation and to the Capital Stock in Maltese Manufacturing firms, Gross fixed Capital Formation in the

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4 5% of Maltese exports of manufactures are exported to Libya, an oil-exporting country, although not classified with the Developed countries, has no foreign exchange problems.

Manufacturing Sector will be used as a proxy for Capacity Installed. It is assumed that additions of Capacity in the productive process will contribute towards higher production. It also implies that higher demand for Maltese exports could be satisfied provided there is no constrains on Capacity. One to two year lag is expected to occur between investment and production.

Upon Malta's association agreement with the EC, in addition to incentive schemes, a considerable amount of foreign direct investment started flowing into Malta (Yannoupolos: 1986), while the volume of exports has shown a distinct upward trend until the late '70s (Pomfret: 1986). In 1978 the EC stopped imports from Malta due to complaints by the UK, an EC member, that Malta was exporting too much to that country. This was followed a year later, by the signing of an agreement which stipulated agreed maximum levels of Maltese textile and clothing exports to the EC. During the '70s Capacity increased to such an extent that after the set back suffered by Malta in 1978, the quotas imposed were never exhausted, (Pace: 1990). If however, capacity was not installed and kept abreast with increased demand, demand could not be absorbed. Malta-EC Association Agreement is believed to have had a direct effect on Maltese exports, (Pomfret: 1986). This might require the introduction of a Dummy variable when estimating the determinants for Maltese exports to examine any significant effect on the model parameters.

Another important determinant of the supply of exports is their price. This should be that received by the producer. It should include the effects of taxes imposed and/or subsidies granted.[5] The most commonly used are relative prices as described above under the section dealing with Demand.

Production costs consist mainly of the price of material inputs and costs of labour (wages). If these prices went up, profitability would go down and production might become squeezed between these input prices and foreign

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5 Subsidies and other concessions extended by the government to export-oriented industries in Malta could be very significant and work themselves back into the final price of exports via profitability.

competitive prices. In fact, Maltese producers of manufactured exports respond to changes in production costs and foreign competitive prices by forfeiting some of their profitability in adjusting their prices, for which reason they are not totally price-takers. When profitability becomes very low, they choose to reduce production (by shedding down employees or reducing capacity utilization) as well as - export oriented firms - make pressure on the government to devalue the Maltese lira (FOI: 1985 p 15, Scicluna: 1987). Devaluation leaves foreign price of exports unaffected, while price of imports and hence price of material inputs, increase which would force prices of exports up.[6] However, the overall effect is positive since higher income from exports (in local currency), increases profitability through which the producers may lower their prices and hence stimulate foreign demand for their products. Producers facing competition may also react by changing technology - but more often than not, the effect of this is felt in the medium to long term. One way to capture these effects in econometric estimates would be the use of a time trend. Generally speaking then, the supply of exports is mainly influenced by the price (and costs of inputs) and Productive Capacity.

2.3 Exports Models Review

2.3.1 General Export Models

One of the leading and most used demand equation for exports of manufactured goods is that proposed by **Houthakker and Magee** (May 1969). In their paper "Income and Price Elasticities in World Trade" HS Houthakker and Stephen P Magee estimated demand elasticities for both imports and exports with respect to income (or rather real GNP) and price for a number of countries. However, in this study, I shall concentrate on the exports function.

The export equation used is of the form:

$$\log X_{jt} = B_0 j + B_1 j \log YW_{jt} + B_2 j \log \frac{PX_{jt}}{PXW_{jt}} + v_{jt} \qquad (2.1)$$

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6 By the 1990s 60 % of Imports were industrial inputs.

where X_{jt} = j^{th} country's exports of merchandise to all other countries in year t, after deflating by export price index

YW_{jt} = index of GNP for 26 importing countries (excluding country j, and each weighted by its 1958 share in the total exports of country j,

PX_{jt} = index of country j's export prices in 1958 dollars,

PXW_{jt}= world export prices given by an index of export prices of 26 other exporting countries (the world price facing country j).

The use of PXW_{jt} as denominator of PX_{jt} means that the export demand equation "reflects competition among the different suppliers to a country rather than competition between that country's imports and its domestic output" (p112).

Houthakker and Magee acknowledged the possibility of bias by not estimating income and price elasticities associated with international trade through a simultaneous-equations model. Yet they still used OLS technique. Perhaps this contributed towards having income elasticities always highly significant. With their article they wanted to show that income elasticities are at least as important as price elasticities. In fact their results showed that income elasticities for industrialised countries are highly significant with their magnitude varying between 1 and 3 while the estimates for the price elasticities turned out to be insignificant for half of the countries they examined. Significant price elasticities varied between 0.5 and 2. For some non-industrialised countries export price elasticity - where significant - varied between 0.4 to 1.3 while the income elasticity estimates were all highly significant with a value of 0.34 to 2. At 4, the income elasticity for Israel was considered exceptionally high. However this could also be the result of simultaneity bias associated with estimating a single-equation model when in fact it is only a part of a larger system.

In fact, single-equation demand models were criticized by **Orcutt** in a 1950 article. He argued that price elasticities tend to be biased downwards for a variety of reasons amongst which is simultaneity bias. If supply is not perfectly price inelastic, the measured price elasticity combines the effects of the elasticity of the supply curve (positive) and the elasticity of the demand curve (negative), biasing the value towards zero. This is also relevant for

income elasticities which would however be biased upwards. Other sources of error and bias listed by Orcutt were: (a) "Errors of Observation": which reduce the accuracy of estimated demand; (b) "Historical Price and Quantity Indices Reflect Price Changes of Commodities with very Different Price Elasticities" - if price changes were largest for those goods with lower price elasticities of demand, then aggregation leads to bias; (c) "Short-run Instead of Long-Run Price Elasticities have been estimated due to the time needed for quantity adjustment; (d) "The Price Elasticity of Demand for Imports or Exports is Probably Much Larger for Large Price Changes than for Small Price Changes" because information with regard to large price changes becomes available to the buyer more quickly and accurately than small price changes; if therefore, measurements are taken during a period of small price changes, the reaction to large price changes will be underestimated.

The aggregation bias and observation errors are a cause of concern. However, one may expect aggregation bias of Maltese exports to be low because Maltese exports consist mainly of clothing and electronic components both of which assumed to be equally sensitive to price changes. The problem related to short and long term price indices, will be reduced because annual data will be used in estimating the demand for exports, while it has been empirically found out that quantity adjustments take place during the current year (Khan M S: ibid). Simultaneity bias remains a problem if demand for exports is treated as a single equation when it is only a part of a larger system. This shall be explored in this Paper.

The assumption of infinite elasticities of supply is often unjustified on *a priori* basis. Since manufactured exports are increasingly consisting of differentiated products, supply rigidity manifests itself the more exported products become tailor-made to individual clients. Moreover, a micro-state like that of Malta, may be at an advantage that its output is too small to cause distortions in the international system so that its actions need not necessarily be restricted by the possible retaliation of competitors, (Selwyn: 1975). So, the *a priori* assumption of infinite exports supply elasticities becomes less justified, (Brakman: 1991).

Mohsin Khan (Khan MS: 1974) extended the model used by Houthakker and Magee to developing countries and obtained similar results. However, Khan pinpointed that if the simple reduced form equation

$$\log X_{it} = \beta_0 + \beta_1 \log \frac{PX_{it}}{PW_{it}} + \beta_2 \log YW_{it} + v_{it} \qquad (2.1A)$$

which is the same as equation 1 above and which can be written as

$$\log X_{it} = \beta_0 + \beta_1 \log [PX_{it} - \log PW_{it}] + \beta_2 \log YW_{it} + v_{it} \qquad (2.1B)$$

were estimated by OLS the underlying assumption of infinite supply price elasticities must hold. Otherwise the estimates would be biased due to simultaneous equation bias. Consequently, Khan specified an export supply equation in log-linear form as :

$$\log X^s_{it} = b_0 + b_1 \log PX_{it} + b_2 \log PD_{it} + b_3 \log Y_{it} \qquad (2.2)$$

where PX = price of exports
PD = domestic price level and
Y = domestic real income.

Domestic Real Income as an explanatory variable of Export Supply seems to be quite curious since economic theory postulates that Income is a function of exports through the multiplier effect (together with other variables) and not the other way around. However, it could be partly justified had there been supply constrains in which case the coefficient on the Real Domestic Income would represent the elasticity of transformation - as income increases domestic demand would compete with exports. Unless the economy for which estimation is made is supply constrained, the inclusion of Domestic Real Income as an explanatory variable of exports supply could therefore have led to more plausible results than the "true" ones when estimating the model simultaneously. For this reason I shall not use Domestic income as an explanatory variable in the export supply function of Malta but instead use a Productive Capacity variable.

Equation 2 was normalised (assuming $X^s_{it} = X_{it}$) to obtain a function for Export prices. It yielded the following:

$$\log PX_{it} = \acute{b}_0 + \acute{b}_1 \log X_{it} - \acute{b}_2 \log PD_{it} - \acute{b}_3 \log Y_{it} \qquad (2.2A)$$

Two-Stage Least Squares method was used to estimate demand for exports using PD_i, Y_i, PW and W as instruments with a linear constraint of β_1 being both the export price elasticity and also the domestic price elasticity.

The results obtained from the above estimations show that price elasticities for half of the countries examined were significantly different from 0, with a value varying from -0.76 to -2.73. The income elasticities for 10 countries out of the 15 examined, were significant but less than unity except for one country.

The price elasticities obtained by Khan were larger (in absolute terms) than those obtained by Houthakker and Magee while the income elasticities turned out to be lower. The overall result indicates that the estimates obtained from the single-equation estimation of Houthakker and Magee suffered from simultaneity bias so that the price elasticities were underestimated while the income elasticities were overestimated, (Orcutt: ibid).

Khan specified also a disequilibrium export equation. The general results showed that short-run price elasticities are also the long-run elasticities and that exports (and imports) adjust within a year to changes in demand so that on an annual basis a static equilibrium model is justified.

Another variant of the reduced form model for the demand for manufactured exports is termed "the Consensus View". This was reviewed by **Riedel** in a 1988 article:

$$\log Q_t = \alpha_0 + \alpha_1 \log P_t + \alpha_2 \log (P_t^* + E_t) + \alpha_3 \log Y_t^* \qquad (2.3)$$

$$(\alpha_1<0,\ \alpha_2>0,\ \alpha_3>0)$$

where Q is the quantity index of domestic exports in period t,

P is the Price of domestic exports, unit value index,

P^* is the foreign currency price of competing goods, given by the weighted index of wholesale prices in major export markets,

E is the weighted nominal exchange rate vis-a-vis the major export markets

and Y^* is the weighted index of real GNP in major export markets as a proxy to the level of economic activity there.

All the variables are expressed in logarithmic form so that α_1 and α_2 are the price elasticities of demand while α_3 is the income elasticity of demand. It was also assumed that the demand function is homogenous of degree 0 and the restriction $\alpha_1 + \alpha_2 = 0$ was imposed. Due to this restriction equation 1 could be written as:

$$\log Q_t = \alpha_0 + \alpha_1 \log (P_t - P_t^* - E_t) + \alpha_3 log Y_t^* \qquad (2.3A)$$

Quarterly data was used so that Q_t had to be seasonally adjusted when estimating the parameters. The main assumption here again is that export supply is infinitely elastic. Riedel used this model in order to compare the results thereof with those from a simultaneous equation model estimation for Hong Kong's manufactured exports. The aim of Riedel's analysis was to show that single-equation estimation produced misleading results due to neglecting the simultaneous interaction of export-supply and demand.

Estimating this single-equation model Riedel found demand to be income-elastic but price inelastic. The long-run price elasticity of demand for Hong Kong exports was estimated at -0.7 while the long-run income elasticity of demand 4. Thus single-equation estimation showed Hong Kong exports to be highly sensitive to the economic conditions in export markets and not so much to export price.

Riedel stresses that low price elasticities and high income elasticities of demand are, at least for the case of Hong Kong exports, the result of simultaneity bias due to overlooking the supply side of LDC Exports. He concluded that the strong income propensity was the result of specification bias. In fact he maintained his argument and re-estimated the demand for Hong Kong's exports of manufactures as a simultaneous three-equation system with a Demand function, a Supply function and a Wage determination equation.
The supply equation used by Riedel is based on the neo-classical production function and profit maximisation under perfect competition and may be written as:

$$\log Q_t = \beta_0 + \beta_1 \log P_t + \beta_2 \log PM_{t-1} + \beta_3 \log W_{t-1} + \beta_4 T + \beta_5 \log Q_{t-1} \qquad (2.4)$$

$$(\beta_1>0,\ \beta_2<0,\ \beta_3<0,\ \beta_4>0,\ 0<\beta_5<1)$$

where Q and P are indexes of export volume and price in period t, PM is material input price index,

W is manufacturing nominal wage index and

T is a trend variable which captures the influence of capacity growth and productivity changes.

Equation 2.4 is a specialised production function where supply of exports depends on its price and on the production costs. It is also affected by capacity growth and productivity change. These variables are captured by a Time trend.

The Wage determination equation was given as:

$$\log W_t = d_0 + d_1 \log PC_t + d_2 \log Q_{t+1} + d_3 T \qquad (2.5)$$

$$(d_1 > 0,\ d_2 > 0,\ d_3 > 0) \text{ and where}$$

W_t = Real wage rate in manufacturing

PC = Consumer price index

Q = desired level of manufacturing output

T = level of labour productivity in manufacturing.

An export price equation was obtained by normalising the export demand function:

$$\log P_t = c_0 + c_1 \log Q_t + c_2 \log (P_t^* + E_t) + c_3 \log Y_t^* \qquad (2.6)$$

$$(c_0 = -a_0/a_1,\ c_1 = 1/a_1,\ c_2 = a_2/a_1,\ c_3 = -a_3/a_1)$$

TSLS on equations 2.4, 2.5 and 2.6 revealed that the demand for Hong Kong exports was found to be infinitely elastic whereas with the single equation model demand for exports was found to be price inelastic. The coefficient for world income was also found not to differ from 0 implying that Hong Kong's exports follow the World's price. Only the coefficient for $(P^*_t + E_t)$ estimated at 0.16 was significant. This meant that what essentially determines the volume of Hong Kong's exports is its ability to compete in World Markets on the basis of price, ie relative prices is the effective determinant of manufactured exports.

Another simple supply equation for manufactured exports presented by **Brakman** is:

$$\log X_s^n = \beta_0 + \beta_1 \log P_n + \beta_2 \log P_{hn} + \beta_3 \log C_n + \beta_4 \log Z^s \qquad (2.7)$$

$$(\beta_1,\ \beta_3 > 0;\quad \beta_2 < 0;\quad \beta_0 \text{ and } \beta_4 \text{ + or -})$$

where X^s_n = volume of export supply

P_n = price index of exports

P_{hn} = price index of goods sold at home

c_n = export capacity

z^s = other variables.

Equation 2.7 states that there is a positive relationship between exports supply and their prices as well as production capacity. Generally, when the domestic prices rise, then producers produce less for exports because the home market would become more profitable. For Maltese exports of manufactures on a priori basis the relationship between supply of exports and its prices as well as production capacity is to be assumed. However, conceptually, the prices of goods sold in Malta do not affect supply of exports in the same way as explained above, because of a) spare capacity within the manufacturing industries (FOI: Oct 1993); b) quite rigid labour relations; c) inability of some export-oriented firms to redirect their production to satisfy the local needs; and d) the limited size of the domestic market. Firms which sell their product both domestically and abroad opt to increase their total output rather than transform their output if there is an increase in demand or if it becomes more lucrative to produce for the local market. The level of domestic prices in general affects the supply of Maltese exports through the cost-push effect; to cut down on cost, producers tend to decrease production (amongst other measures).

2.3.2 Estimates of Demand Elasticities of Maltese Exports

Price and income elasticities of Maltese exports (and imports) were estimated in an econometric study carried out by **Briguglio** (1989) on examining the impact of a devaluation on the Maltese trade balance with special reference to price and income reversal effects. The export and import demand equations are similar to those used by Houthakker and Magee (ibid) where exports are assumed to depend on relative export prices and on the income of "client" countries and are influenced

by domestic capacity utilisation. The whole model specified by Briguglio is:

Export Demand:

$$XVM_t = a_0 PRX_t^{a_1} ECA_t^{a_2} CAF_t^{a_3} u_{1t} \quad (2.8A)$$

Import Demand:

$$MVM_t = b_0 PRM_t^{b_1} GDP_t^{b_2} CMC_t^{b_3} CAF_t^{b_4} u_{2t} \quad (2.8B)$$

Relative Export Prices:

$$PRX_t = EXR_t \left(\frac{PXM_t}{PXC_t}\right) \quad (2.8C)$$

Domestic Export Prices:

$$PXM_t = c_0 PMM_t^{c_1} RWR_t^{c_2} PRD_t^{c_3} u_{4t} \quad (2.8D)$$

Relative Import Prices:

$$PRM_t = \left(\frac{PMM_t}{PXC_t}\right) \quad (2.8E)$$

Domestic Retail Prices:

$$PXM_t = d_0 PMM_t^{d_1} RWR_t^{d_2} PRD_t^{d_3} u_{6t} \quad (2.8F)$$

Induced GDP:

$$GDP_t = e_0 XVM_t^{e_2} INV_t^{e_3} GVE_t^{e_4} u_{7t} \quad (2.8G)$$

where XVM = Maltese Merchandise Exports by Volume,

PRX = Relative Price of Maltese exports with respect to those of competitor countries; it reflects changes in competitiveness due to changes in the NER of the Maltese Lira and due to changes in domestic prices relative to prices in competitor countries measured in a common currency.

ECA = Economic Conditions Abroad,

CAP = Capacity Utilisation,

PRM = Relative Import Prices,

CMC = Government Import Controls (a dummy variable)

PXM = Price of Maltese Merchandise Exports measured by the unit value of exports in Maltese currency,

PXC = A Weighted Average of the Price of Merchandise exports of competitor countries in US$,

PMM = Prices of Maltese merchandise imports (unit value),

RWR = Average real Hourly Wage Rate,

RPI = Maltese Retail Price Index,

XVS = Maltese Exports of Services,

INV = Gross Capital Formation in Real Terms,

PRD = Dummy Variable for autonomous shift in prices 1974-1979

GVE = Government Current Expenditure in real terms.

The equations were expressed in multiplicative form so that the exponents represented elasticities.

The export-demand equation is a type of reduced form equation since it incorporates supply elements. However, there was not a separate supply equation for exports. The relative price equation states that the relative price of Maltese exports (PRX) is determined by the exchange rate of the Maltese lira (EXR) and by the ratio of domestic export prices (PXM) to competitor countries' export prices (PXC). PRX is therefore an index of the real effective exchange rate - implying that the exchange rate of the Maltese lira is adjusted for price changes in Malta relative to those in competitor countries.

The ratio PXM/PXC is measured by the unit value of exports of competitor countries, both measured in terms of the respective domestic currencies. Domestic export prices (PXM), is the unit value of Maltese exports. They are assumed to be affected by the prices of imports (PMM), and by domestic inflationary pressures reflected by the real wage rate index (RWR).

A Koyck distributed lagged scheme was incorporated in the export demand equation by adding a lagged dependent variable as one of the explanatory variables. However, estimation results were not satisfactory implying that adjustments for exports take place within the same year. This was also the conclusion of Khan M S (cited above). His estimates indicated that on an annual basis a static equilibrium model may be justified (Khan MS 1974, page 692).

The results obtained by Briguglio showed that the export-volume/export-price elasticity a_1 was estimated to be -3.79 and the foreign income elasticity was

estimated at 6.02 while the parameter on capacity utilisation turned out to be insignificant.

Compared to the estimates mentioned earlier, both elasticities are very high, much higher than those estimated elsewhere. The results state that a 1 percent change in the relative price of Maltese exports would instigate a 3.8 % change in the demand for exports while a 1 % change in the economic conditions in buyer countries (herein represented by production), would cause a change of 6 % in Maltese Exports. Although this could be due to the openness of Malta's economy, the share of Malta's exports in the international market is so small that an international recession might not affect Malta's economy with the same intensity that it affects larger economies. If this is the case, the income elasticity might be the result of overestimation due to simultaneity bias. On the other hand, price elasticity might not be biased so much because it is the result of simultaneous estimation. In any case, both elasticities seem to be very high.

Scicluna (Dec 1988) uses a more simple log-linear reduced form function for Maltese exports:

$$LMEVI = c_0 LOIE + c_2 LERTGU + c_3 DE794 + c_4 D1 + c_5 D2 + c_6 D3 + u \qquad (2.9)$$

where LMEVI = log of Maltese Exports Volume Index
LOIE = Production of Principal European Trading Partners
LERTGU = Real Effective Exchange Rate (export weighted W Germany, The UK and Italy)
DE794 = Dummy Variable = 0 for 1971.1 - 1979.3,
= 1 for 1979.4 - 1987.4
D1, D2, D3 = Seasonal Dummy Variables.

If we break RER in its components PD/P* * 1/Lm/US$ and express them in their log form, we arrive at equation 2.3A given by Riedel. Starting from the definition of the RER as given by Helmers (FLCH Helmers: 1988)

$$RER = \frac{En}{P_D} / \frac{\$}{Pw}$$ where En is the nominal exchange rate expressed in units of domestic currency per US$, Pd is an appropriate price deflator for the domestic currency eg Consumer Price Index and PW is an appropriate price deflator for US$ eg US Wholesale Price Index which is heavily weighted with tradeable goods. As presented here, RER measures the movement of relative prices of tradeables vis-a-vis home goods. Moreover, under normal circumstances as RER increases eg as a result of Devaluation, exports are expected to become relatively cheaper. Conversely, if we inverse the definition we arrive at [7]

$$RER = \frac{P_D}{P^*} * \frac{1}{Lm/US\$}$$

Applying this definition exports are expected to respond negatively to an increase in RER. If we take this definition of RER, decompose it and take the logs, we arrive at :

$$\log RER = \log Pd - \log P^* - \log EXR(Lm/\$)$$

or

$$\log RER = \log Pd - (\log P^* + \log EXR(Lm/\$)$$

Then, equation 2.9 (excluding dummy variables for simplicity), becomes:

$$LMEVI = c_0 + c_1 LOIE + c_2 (\log Pd - \log P^* - \log EXR) \qquad (2.9A)$$

where $c_1 > 0$ and $c_2 < 0$.

This is the same as equation 2.3 - the consensus view - as presented by Riedel, only that Riedel uses Real GNP as the income variable while Scicluna uses Output of "client" countries.[8] The results show that Maltese Exports are affected by the RER (ie relative prices of exports, the coefficient = - 2.373), and by the

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[7]This is the way the RER for Malta is presented in the IFS Tables.

[8]Moreover, the WPI used in RER ia a weighted one based on major imoporters of Maltese Exxports.

level of economic activity in Trading Partners whose coefficient was estimated at 1.46.

It is important to note the significant difference between the values of these parameters and those obtained by Briguglio as well as those obtained by Riedel when estimating the same model (price elasticity = -0.68 while income elasticity was estimated at 4.05). This could be attributed to different specification of the models as well as to different time series or the particular behaviour of Maltese exports.

2.4 A Simultaneous-Equations Model for Maltese Exports

The demand for exports of Maltese manufactures will be modelled in a simultaneous system similar to that used by Mohsin Khan (1974) with some adjustments as deemed proper. It shall establish the effect of such simultaneous estimation on the price and income elasticities in contrast with a single-equation estimation. The model proposed for Maltese exports of manufactures is the following:

Demand Equation:

$$\log X^{d}_{\$_t} = B_0 + B_1 \log WY_t + B_2 \log \left(\frac{PX_t}{PXW\$_t}\right) + v_t \qquad (2.10)$$

which can be written as:

$$\log X^{d}_{\$_t} = \beta_0 + \beta_1 [\log PX_t - \log PW_t] + \beta_2 \log WY_t + v_t \qquad (2.10A)$$

Supply Equation:

$$\log X^{s}_{Lm_t} = \alpha_0 + \alpha_1 \log PX_t + \alpha_2 \log CPI_t + \alpha_3 \log CAF_t + u_t \qquad (2.11)$$

Since the Demand Equation is in terms of US $ and the Supply Equation is in terms of Domestic Currency, these two equations must be linked to each other through the exchange rate. For this reason a price identity function is introduced in the model so that the whole model consists of two behavioural equations and a set of four identities:

$$\log X^{s}_{Lm_t} = \log X_{\$_t} + \log EN_{(85)} \qquad (2.12.1)$$

$$\log PX_{Lm_t} = \log PX_{\$_t} + \log ENI_t \qquad (2.12.2)$$

$$\log ENI_t = \log EN_t - \log EN_{(85)} \qquad (2.12.3)$$

$$\log RPE_t = \log PX_{\$_t} - \log PXW_{\$_t} \qquad (2.12.4)$$

where EN = nominal exchange rate Lm/US$

ENI = nominal exchange rate index, base 1985.

$X^{d}_{\$}$ = Maltese domestic exports in US $ deflated by export price index in terms of US$

X^{d}_{Lm} = Maltese domestic exports in domestic currency

$PX_{\$}$ = price of exports - unit value index in terms of US$

PX_{Lm} = price of exports - unit value index in Maltese currency

PXW$ = World export prices given by an index of export prices of Malta's main competitor countries

YW = economic conditions in Malta's "clients"

CPI = domestic price level - Malta's CPI

and CAF = Productive Capacity

The demand equation states that Maltese exports of manufactures is influenced by the price that exports fetch on the international market. The use of PXW$ as denominator of PX_{Lm} reflects competition among the different suppliers to Malta's "clients" rather than competition between imports and domestic output. Domestic exports are also expected to be influenced by the level of economic activity in Malta's clients. It is conceptually accepted that economic recessions in the world affect negatively the demand for Maltese Exports. This stands to be proved. The Supply equation states that the higher the price of Maltese exports the higher the volume of exports produced. It is also implied that supply of manufactured exports depends on the level of domestic prices (which affect

price). The higher the domestic price level the lower the supply of exports. The Supply of manufactured exports is also affected by Productive Capacity, implying that capacity constraints might exert a negative pressure on the supply of exports produced by manufacturing firms.

Substituting equations 2.12.1, 2.12.2, and 2.12.3 into 2.11 we derive the following Supply function in terms of US$.

$$\log X_{\$_t} = c_0 + c_1 \log PX_{\$_t} + c_2 \log EN_t + c_3 \log CPI_t + c_4 \log CAF_{t-2} \qquad (2.11A)$$

Equation (2.11A) must be interpreted with some caution since the elasticities in the supply function as presented there are ex-post and reflect the overall effect of changes in the variables on the dependent variable. For instance, changes in the nominal exchange rate will, at least at first, leave the dollar price of Maltese exports intact. It is only after some adjustment that the foreign price of exports will change depending on the exigencies of producers, their profitability and the level of competitiveness that their products enjoy on the international market. This issue will be further dealt with in a later chapter when analysing the estimation results.

Before estimating the parameters using the models discussed in this Chapter I shall present the Data used in this Research Paper.

CHAPTER 3

THE DATA

3.1 Introduction

This Chapter introduces the Data used in this study on Maltese Exports of manufactured goods. It seeks to explain the main features of the variables used in the model and their derivation. This is important because the "goodness" of the empirical results of any study and this research in particular, strongly depends on the data used.

3.2 Data Sources

The main source is the International Financial Statistics and Yearbooks published by the IMF and the Direction of Trade Statistics. Where updating and additional data were needed the Malta Central Office of Statistics publications, National Accounts Statistics, Trade Statistics and the Census of Industrial Production were consulted. The Economic Survey was used especially for data required in Chapter 1. Here follows a list of data sources used, for ease of reference:

International Monetary Fund Publications

International Financial Statistics, various issues.

Direction of Trade Statistics Yearbooks, various issues.

Malta: Central Office of Statistics Publications

Census of Industrial Production, and Summary Tables, various issues.

National Accounts of the Maltese Islands, various issues,

Trade Statistics, various issues.

Malta: Other Statistical Publications

Economic Survey various issues, Economic Planning Division, Malta.

Industry Trends Survey - Second Half 1993 - No 42 - Malta Federation of Industries Crest Publicity Ltd, Valletta Malta, Oct 1993.

The Maltese Economy in Figures various issues, Economic Planning Division, Ministry of Finance, Malta.

All the Data were measured at constant (1985) prices. Where the values for any part of the time series were constructed using a base period other than 1985, it was necessary to splice the different series.

The longest time-series for the estimation of the proposed model is 1963-989 because secondary data relating to other years are missing - if not for all the countries for some of them and/or for some variables. For instance Value and Volume Indices for Maltese Exports prior to 1964 is non-existent while the series were discontinued in 1989 because it was argued, (Delia: 1992), that the reliability of these deflators could be seriously questioned because the composition of the trade flows in the nineties is very different from what it was in the base years, (i.e. 1973 and 1980 for the Malta Trade Statistics and 1985 for IFS). Therefore this has to be borne in mind when dealing with these indices in estimating the model parameters.

3.3 Variable Description

$X_{\$}$ Maltese Exports in US$ were obtained from IFS Yearbook, 1993, pp 110-111; these were deflated by export price index in terms of US$ also obtained from the same source. For the Export Price Index in the Demand Equation, I used the Export Unit Value Index in terms of US$ (1985=100) as given in the IFS Yearbook, pp 120-121, while the Unit Value Index for Maltese exports in terms of domestic prices was used for the Supply function since producers are mainly concerned with domestic price levels. Graphical representation of these variables can be seen in **CHART 3.1A** and **CHART 3.1B**

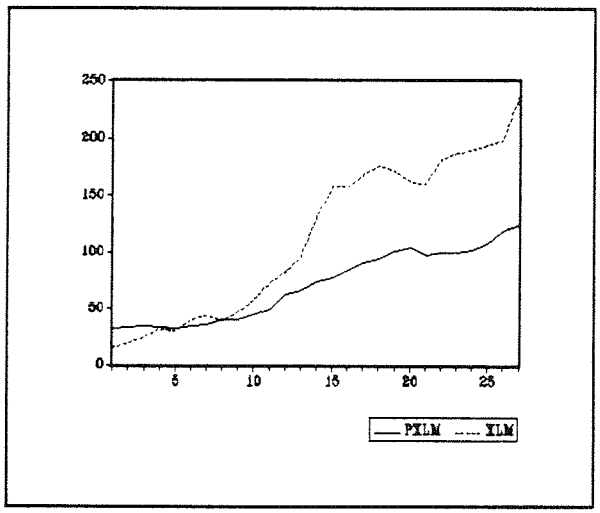

CHART 3.1A

XLM=value of exports LmM (85 pr)
PXLM=price of exports (Lm) 1985=100

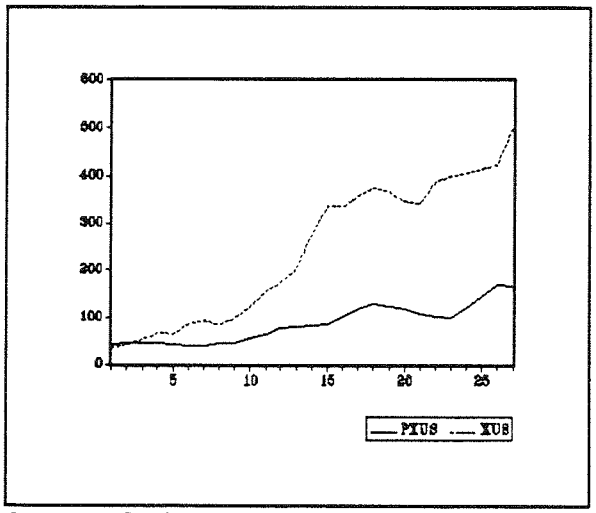

CHART 3.1B

XUS=value of exports US$M (85 pr)
PXUS=price of exports US $ (1985=100)

WY World Income: the economic conditions of Maltese exports "buyers". Since it was not feasible to get the data for all, it was the intention to base this variable on Malta's top-ten buyers in 1989, namely, Italy, Germany, UK, USA, France, Libya, USSR, Singapore, Belgium/ Luxembourg and the Netherlands in that order. Maltese exports to these countries in 1989 (and for previous years), represented 90% of the total Maltese Domestic Exports. Yet, not all of these countries were included in the calculation of WY because: (a) Singapore started to feature in the top 10 only since 1987 and (b) Libya and the USSR were excluded because data relating to these countries were not available for some of the years. Nevertheless, the rest of the countries, between them, bought 80% of the total Maltese Domestic exports and hence were considered as a very good representative of " the whole World", (Source: Direction of Trade Statistics).

WY was calculated by weighting the real GDP in US$ of each country, by the share of Maltese exports to that country in total Maltese exports to those countries in 1976. The weights in 1976 were chosen because they were the closest to the average weights over the whole time-series. This yielded a weighted income for each country. These were summed up to get WY. **Chart 3.2** plots WY and Maltese exports in real terms while **Appendix 3.1** shows the compilation of WY.

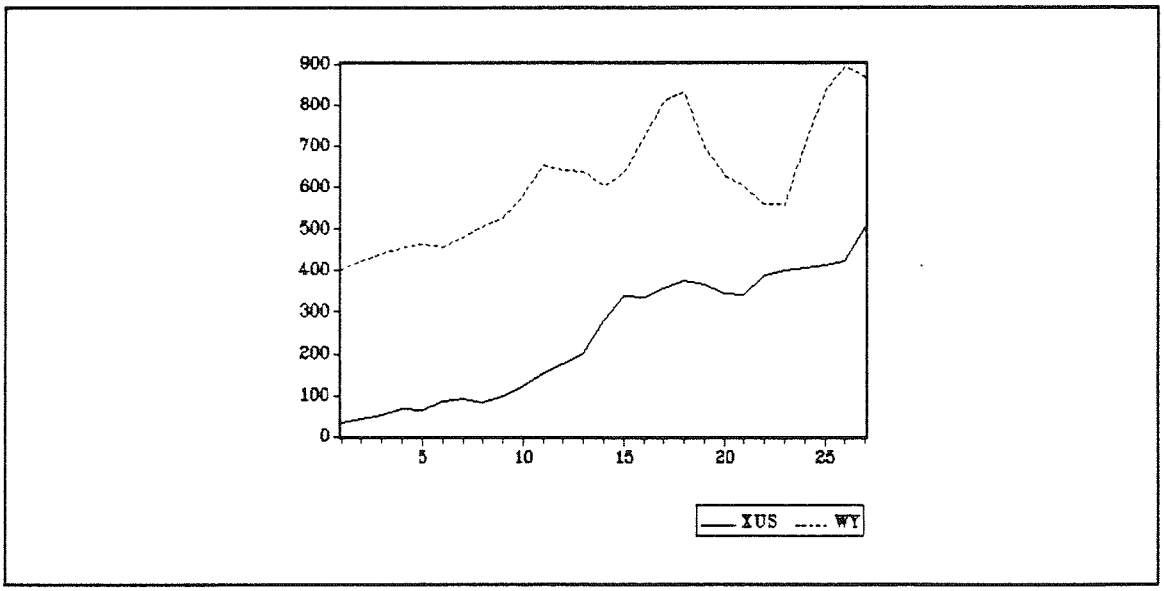

CHART 3.2

Visually one can deduce that there was an upward trend in both variables up to 1980 with some short term fluctuations. It is also evident that the "world" recessions in the early '70s and then in the early '80s did not have the same effect on Maltese exports or rather Maltese exports behaved somewhat differently under the two recessions. While Maltese exports maintained their upward trend in the '70s, they still continued to grow during the '80s but at a lower rate, even when the world recession was at its worst. Therefore, graphically one can already get an indication about the relationship between "world"'s income and Maltese exports.

GDP The Gross Domestic Product of several countries was needed in this study. The source of this data was the IFS Tables. For some countries this data was given at current prices and in the domestic currency. In such cases therefore, the GDP deflator supplied by the IFS tables was used to deflate the GDP data to 1985 prices. The respective exchange rate was used to convert the GDP at constant prices in terms of the domestic currency into US dollars.

CPI Domestic Price Level: this is the Consumer Price Index of Malta. The Source was the IFS Tables - Consumer Prices, 1985=100.

RPE $PX_{\$}/PXW_{\$}$: Relative Export Prices: this composite variable (see below), implies that since exports cross borders and is "sold" on the international market, then it is subject to competitive prices of similar goods - let alone non-price competition!

$PX_{\$}$ Price of Exports: Unit Value Index in terms of US $, 1985=100, Source : IFS Yearbooks.

$PXW_{\$}$ World Export Prices (competitive exports' prices), given by an index of export prices of Malta's main competitor countries (measured in US $). This was calculated by weighting the Unit Value of Exports in terms of US$ of five major importers of Maltese products (Germany, the UK, Italy, Belgium and the USA), assuming that Maltese products compete with similar products produced in these countries, and five Mediterranean countries

(Cyprus, Greece, Israel, Tunisia and Spain), which due to close proximity and the level of trade with Malta's trading partners are considered as its competitors.

The weightings were assigned according to the share of merchandise exports of each country to the total merchandise exports of the other 10 countries and a second weighting based on the share of these countries' exports in Malta's "client". **Appendix 3.2** shows the computation of $PXW_{\$}$ for 1963. The same procedure was used in the computation of the same variable for all the years in the time series. The inclusion of all the workings would have been too voluminous. However, the time series is given in **Appendix 3.3.**

CAF Productive Capacity : through this variable one would capture the influence of any supply constraints in the production process. In the absence of data pertaining directly to Productive Capacity, for instance Capital stock in the manufacturing sector, incremental capital stock is used in stead. This was done by taking the Gross Fixed Capital Formation, excluding construction, in the manufacturing sector, and excluding public enterprises. Public enterprises were excluded because generally these are not export oriented. Data in Gross terms were used because that part which replaces capital consumption is important to replace any "deductions" from the existing productive capacity. The data for this variable were obtained from various issues of the National Accounts Statistics for the Maltese Islands and deflated by the GDP deflator (1985 = 100) obtained from the IFS Statistics Yearbook. A time lag of 1 to 2 years was expected between investment and production. Estimations of the Supply function indicated that a time lag of 2 years explains the Supply of Maltese exports better than a 1 year time lag.

EN The nominal exchange rate of the Maltese currency in terms of Liri to the US Dollar.

ENI Is an index of the nominal exchange rate of the Maltese lira in terms of US $ (1985=1). Thus ENI = EN*EN(1985)

3.4 Data Transformation

When the variables are transformed into their natural logarithmic form it is either represented by the letter l in front of the variable name or by the abbreviated word "log". Logarithmic transformation was used throughout because the main concern is the elasticities. In fact one may consider the equations in a multiplicative form as shown in the general equation 3.1, so that when they are transformed into logarithmic form the coefficients denote elasticities.

$$If\ Y = \alpha X^{\beta} Z^{\gamma} + u,\ \ then\ \ \log Y = \alpha + \beta \log X + \gamma \log Z + u \qquad (3.1)$$

Appendix 3.3 includes the whole data-set of the variables used in the Research Paper.

CHAPTER 4

ESTIMATION RESULTS AND ANALYSIS

4.1 Introduction

This Chapter presents the estimation results of the elasticities of Maltese Exports. It will start by applying the single equation model proposed by Houthakker and Magee. The results from this estimation will be compared to those obtained through a simultaneous model proposed for Maltese exports. Test for simultaneity bias will follow in order to establish the functional form of the demand for Maltese Exports and in so doing determine as accurately as possible the demand elasticities. Supply factors will also be analysed by estimating the Supply function.

4.2 Demand for Exports - Single Equation Estimation

Houthakker and Magee used the following single-equation specification for the demand of Exports:

$$\log X_{S_t} = \beta_0 + \beta_1 \log WY_t + \beta_2 \log RPE_t + v_t \qquad (4.1)$$

which was already motivated in an earlier Chapter.

OLS estimation of this model on Maltese Exports yielded the following results:

$$\log X_{S_t} = -8.1 + 2.2 \log WY_t - 5 \log RPE_t \qquad (4.1A)$$

(t-stat) (-4.86) (8.63) (-6.80)

R squared: 0.92 D W statistic: 1.42

The results are plausible with correct signs and significant t statistic. However the elasticities seem to be very high while there is inconclusive evidence as to whether there is positive first order serial correlation.

Equation 4.1 can be rewritten as

$$\log X_t = \beta_0 + \beta_1 \log PX_t + \beta_2 \log PW_t + \beta_3 \log WY_t + v_t \qquad (4.2)$$

where $\beta_2 = -\beta_1$ assuming homogeneity of degree 0 in prices so that no money illusion prevails.

LS estimation of equation 4.2 yielded the following:

$$\log X_t = -2.4 - 2.9 \log PX_t + 3.8 \log PW_t + 0.63 \log WY_t \quad (4.2A)$$

t statistic (-1.51) (-4.44) (6.87) (1.83)

R squared: 0.98 D W statistic: 1.57

The results obtained are plausible; all the parameters except for the constant term are significant at the 5 % level. The income elasticity's significance is based on a 1-tailed test since *a priori* it is expected to be larger than 0. The domestic price elasticity of demand is -2.9; if the price of Maltese exports in terms of US$ increases by 1%, the demand decreases by 2.9%, while if the prices of competing exports in competitor countries increase by 1 % demand for Maltese exports will increase by 3.8% since the foreign price elasticity is 3.8. At 0.63, the income elasticity is rather low. If the economic conditions in Malta's "client" countries improve by 1%, the demand for Maltese exports by these countries is expected to go up by 0.63 %. R^2 is very high while the DW statistic is still inconclusive but very close to the upper limit (d_l=1.123, d_u=1.654). The restriction on the prices in the demand equation that $\beta_2 = -\beta_1$ will be tested under the section dealing with TSLS estimation.

The general conclusion from the above estimations are that both price and foreign income elasticities determine the demand of Maltese exports while price elasticities are relatively higher than income elasticity of demand.

4.3 Supply of Maltese Exports-Single Equation Estimation

The proposed supply function of Maltese exports is similar to that presented by Mohsin Khan (Eq 2.2 above) (Khan: 1974), but substituting Real Domestic Income with a Productive Capacity Variable. The limitation of using the Gross Fixed Capital Formation as a proxy for Productive Capacity cannot be overemphasised. A lag in the Capacity variable was introduced since it was assumed that there was a lag between capital formation and output. The Supply function estimated in terms of the domestic currency is the following:

$$\log X^{s}_{Lm_t} = \alpha_0 + \alpha_1 \log PX_t + \alpha_2 \log CPI_t + \alpha_3 \log CAF_{t-2} + u_t \qquad (4.3)$$

OLS estimation yielded the following results:

$$\log X^{s}_{Lm_t} = 0.4 + 2.0 \log PX_t - 1.17 \log CPI_t + 0.28 \log CAF_{t-2} \qquad (4.3A)$$

(t stat) (0.58) (9.22) (-3.23) (2.52)

R-squared: 0.98 D W statistic: 1.57

All the parameter estimates except the constant term are significant and plausible. They show that if the price of exports increased by 1% domestic producers produce 2% more while they lower their production by 1.2% for every 1% rise in the domestic price level. The estimate of the parameter on the gross fixed capital formation in machinery in the manufacturing sector indicates that there is a positive relationship between this and the supply of exports. It indicates that for a 1% increase in Productive Capacity Maltese exports grow by 0.28% after 2 years. These variables explain 98% of the behaviour of exports supply. However, the D W statistic still lies in the inconclusive region.

OLS estimation was also applied to the supply equation in terms of US $. This was derived from the supply equation in terms of Maltese Liri (equation 4.3):

$$\log X^{s}_{\$_t} = \alpha_0 + \alpha_1 \log PX_{\$_t} + \alpha_2 \log EN_t + \alpha_3 \log CPI_t + \alpha_4 \log CAF_{t-2} + u_t \qquad (4.4)$$

Estimation of this equation using OLS technique yielded the following results:

$$\log X^{s}_{\$_t} = 3.13 + 2.06 \log PX_{\$_t} + 2.54 \log EN_t - 1.2 \log CPI_t + 0.26 \log CAF_{t-2} \qquad (4.4A)$$

(t stat) (3.71) (9.75) (7.11) (-3.45) (2.39)

R-squared: 0.98 D W statistic: 1.86

The above results which are quite similar to those obtained for the last previous estimation must be interpreted with some caution as explained in Chapter 2 above. These are only indicative because strictly speaking, Domestic producers are mainly interested in what they get in Maltese currency.

If, for instance, we take the nominal exchange rate, a devaluation or depreciation of the Maltese currency would leave the dollar price of exports unchanged. But Exporters would increase their profitability. It will also push the domestic price level up as well as the prices of exports due to the high import content of both the private consumption - which may push wages up - as well as exports. Depending on their competitive position, it is the producers' option to either supply the same amounts at lower dollar prices or produce more at the same dollar prices, (Orcutt: 1950). Maltese producers' reaction depends on how much they can squeeze their profitability in order to regain their competitiveness over foreign producers when they sense that they are loosing it. If they could not, they pledge Government to devalue the currency.

Although formal "across the board" devaluation came as late as 1992, certain measures taken over the years, for instance changing the weights of the basket of currencies making up the Maltese lira and measures to curb inflation, had similar effect. Upon a devaluation exporters may lower the dollar price of exports to an extent that although their dollar revenue decreases, the revenue in Maltese currency may increase and so does profitability. Due to cheaper relative dollar prices of Maltese exports, foreign demand increases and Maltese producers are then able to increase supply accordingly because productive capacity (which partly depends on the level of profitability) seems to be forthcoming. Moreover, Maltese firms do not operate at full capacity utilisation (FOI Oct 93). The higher the prices that exports fetch for domestic producers, the higher the profitability and the more producers would like to produce. However, one must not ignore the demand side of exports where the higher the domestic price of exports, in dollar terms, the lower the foreign demand for them. This is in fact another reason why it is argued that Maltese exports elasticities are the result of simultaneous interaction.

The analysis given above pertains to Ordinary Least Squares estimation of the demand and supply functions of Maltese Exports of Manufactures. Now follows the simultaneous estimation of the model proposed in Chapter 2 in order to test for simultaneity bias and to see whether or not the same inter-relationships discussed above hold true also when estimating the export functions simultaneously.

4.4 Simultaneous Estimation of the Demand and Supply Functions

So far we have only dealt with single-equation estimation of the various parameters which affect Maltese exports. The specification of the Demand and Supply functions implies simultaneous interaction. Single equation estimation would therefore violate assumption 6 of OLS and the estimates obtained from such a technique would suffer from simultaneity bias. To avoid this bias the demand and supply functions will be estimated simultaneously using Two-Stage Least Squares Technique. Subsequently a test for simultaneity bias will be conducted in order to establish formally whether Maltese exports' elasticities could be estimated as a single equation or as a simultaneous system.

4.4.1 Two-Stage Least Squares Estimation Results of The Unrestricted Demand Function

The Results obtained from estimating the demand function (equation 4.1), using LEN, LCPI and LCAF(-2) as IVs, are as follows:

$$\log X_{\$_t} = -5.8 + 1.8\log WY_t - 6.9\log RPE_t \qquad (4.1B)$$

(t-stat) (-2.75) (5.84) (-6.44)

R-squared: 0.85 D W statistic: 1.56, (D_u=1.55)

4.4.2 Two-Stage Least Squares Estimation Results of The Restricted Demand Function

The Results obtained from this estimation are the following:

$$\log X_{\$_t} = -1.91 + 0.75\log WY_t - 4.44\log PX_{\$_t} + 5.12\log PXW_{\$_t} \qquad (4.2B)$$

(t-stat) (-0.92) (1.54) (-3.61) (5.03)

R-squared: 0.94 D W statistic: 1.86

The restriction imposed on the prices in the demand equation that $\beta_1 = -\beta_2$ was

tested by the F test[9]. The result of this test indicates that we cannot accept that the demand for Maltese exports is homogenous of degree 0 in prices. However, if one looks at the elasticities one would notice that they carry opposite signs as expected and are not very different from one another in magnitude. Moreover, non-homogeneity might not necessarily reflect money illusion. As explained by Krisnaji (1992, cited in Mukherjee, C et al: 1994), serious problems associated with highly aggregated time serious data may emerge. In the present exercise it has been assumed that changes in income have been distributed proportionately across households and across countries, while in reality income distribution may worsen with raising income while not all the countries included in this exercise experienced the same level of income growth. Moreover, various indices are used in the model - changes in a particular price index does not mean that all prices change at the same rate. With aggregate data the homogeneity assumption is not direct (Mukherjee: 1994).

The results from the simultaneous estimation show that the income elasticity for Maltese exports is only significant at the 10% level while it is not different from 0 at the 5% level. It was significant under the OLS estimation. The price elasticities of demand are larger in magnitude than those obtained from OLS estimation. These results in fact show that OLS estimation of the demand for Maltese exports when in fact it is a part of a larger system leads to under estimation of the price elasticities and overestimation of the income elasticity due to simultaneity bias. This will be tested in the next section.

4.4.3 Two-Stage Least Squares Estimation Results of The Supply Function

Simultaneous estimation of the Supply function (equation 4.3), using Two Stage Least Squares estimation yielded the following results:

9

$$F^* = \frac{RSS_r - RSS_u}{RSS_u} * (n-k) = \frac{1.887-0.778}{0.778} * 21 = 29.93$$

Since $F^* > F_{tables}$ we cannot accept the H_0 that $\beta_1 = -\beta_2$

$$\log X_{\$}^{s} = 0.66 + 2.2 \log PX_{\$} - 1.4 \log CPI + 0.29 \log CAF_{t-2} \quad (4.3B)$$

(t-stat) (0.82) (9.42) (-3.7) (2.52)
R-squared: 0.98 D W statistic: 1.65

4.4.4 Two-Stage Least Squares Estimation of The Supply Function in terms of US$

The results obtained by Two Stage Least Squares estimation technique of equation 4.4 are as follows:

$$logX_{\$} = 3.54 + 2.27\, logPX_{\$} + 2.8\, logEN - 1.46\, logCPI + 0.26\, logCAF_{t-2} \quad (4.4B)$$

(t stat) (4.04) (9.93) (7.42) (-3.98) (2.35)
R-squared: 0.98 D W statistic: 1.98

These results are similar to those obtained from OLS estimation of the Supply function (eq 4.4A), but with a little larger coefficients. The D W statistic improved and it shows that there is no serial correlation in the estimation.

Normalizing the Supply equation for the price of exports, we arrive at:

$$\log PX_{\$_t} = \acute{\alpha}_0 + \acute{\alpha}_1 \log X_{\$_t} + \acute{\alpha}_2 \log EN_t + \acute{\alpha}_3 \log CPI_t + \acute{\alpha}_4 \log CAF_{t-2} + u_t \quad (4.4.1)$$

$$where \acute{\alpha}_0 = \frac{\alpha_0}{-\alpha_1}, \quad \acute{\alpha}_1 = \frac{1}{\alpha_1}, \quad \acute{\alpha}_2 = \frac{\alpha_2}{-\alpha_1}, \quad \acute{\alpha}_3 = \frac{\alpha_3}{-\alpha_1}, \quad \acute{\alpha}_4 = \frac{\alpha_4}{-\alpha_1}$$

Estimation of this equation using OLS technique yielded the following results:

$$logPX_{\$_t} = -1.6 + 0.4\, logX_{\$_t} - 1.2\, logEN_t + 0.7\, logCPI_t - 0.1\, logCAF_{t-2} \quad (4.4.1A)$$

(t stat) (-4.9) (9.7) (-11.2) (6.1) (-2.2)
R-squared 0.99 D W statistic: 1.94

The results given by this estimation which are "ex-post" are consistent with those obtained from the TSLS estimation of the Supply Equation and indicate the effects that the explanatory variables exert on the price of exports. They also indicate that the price of Maltese exports is not exogenous but that producers could make adjustments according to the influences on their production process.

4.5 Hausman's Specification Test

4.5.1 Hausman's Specification Test on the Price Estimates (log $PX_{\$}$) in the Restricted Demand Function.

This test checks whether or not q_1 is different from 0 where:

$$q_1 = b_1^{IV} - b_1^{OLS} = -4.441 - -2.877 = -1.564 \quad (4.5)$$

H0 : q = 0 Price of exports is exogenous

Ha : q ≠ 0 Price of exports is not exogenous and therefore we shall accept estimates from the simultaneous relationship.

To run this test we need to know the partial regression coefficient between the variable whose endogeneity we are testing (ie the price of exports and the instruments used.

Partial Regression Results

The correlation coefficient between the logs of the price of exports (ie the variable whose endogeneity we are testing), and the logs of EN, CPI and CAF(-2) (the IVs), was 0.95.

The statistic for Hausman's specification test is given by:

$$m = \frac{q^2}{Var(q)} \quad (4.6)$$

which is a Chi squared with 1 degree of freedom.

$$m=\frac{q^2r^2}{(1-r)\,Var(b_1^{OLS})}=\frac{-1.564^2.948^2}{1-.948^2.648^2}=\frac{2.4461*0.8987}{(1-0.8987)*0.420}=51.67 \qquad (4.7)$$

Since this calculated value of 51.67 > Chi^2 at the 5% level of 3.84, so we reject the H_0 that q is insignificantly different from 0.

Since q > 0 at the 5 % level, the difference between the TSLS and OLS estimation is significant. This means that there is simultaneity bias associated with OLS estimation. Hence simultaneous estimation technique should be used.

4.5.2 Hausman's Specification Test on the Price Estimates (log $PX_{\$}$) in the Unrestricted Demand Function.

We shall use the same null and alternate hypotheses as in the last preceding section. We also need to know the regression coefficient between log RPE and its instruments, which is 0.76.

$$q_1 = b_1^{IV} - b_1^{OLS} = -6.9646 - -4.9628 = -2.0018 \qquad (4.8)$$

$$m = \frac{q^2r^2}{(1-r)\,Var(b_1^{OLS})} = \frac{-2.0018^2 * 0.76^2}{1-0.76^2 * 0.648^2} = 10.282 \qquad (4.9)$$

Since m > Chi^2, the difference between TSLS and OLS is significant. Therefore, OLS estimation yielded biased estimates in this case as well. Hence, a simultaneous equation estimation is a right technique to be used while estimating the determinants of Maltese exports.

4.5.3 Hausman's Specification Test on the Price Estimate in the Supply Equation

The same Hypotheses used in the previous Hausman's test should also hold here. The regression coefficient between log PX_{Lm} and its Instruments is 0.995.

$$m = \frac{q^2r^2}{(1-r)\,Var(b_1^{OLS})} = \frac{2.185-2.001^2 * 0.995^2}{1-0.995^2 * 0.217^2} = 71.36 \qquad (4.10)$$

Since m > Chi^2, we cannot accept the null hypothesis that price of exports is exogenous and hence simultaneous estimation like Two Stage Least Squares was the right technique since it yielded consistent and unbiased estimates.

4.6 The Model for Maltese Exports of Manufactures

Therefore the estimates for the Maltese Exports Model are the following:

Demand Equation (unrestricted)

$$\log X^{d}_{\$_t} = -5.8 + 1.8 \log WY_t - 6.9 \log RPE_t \qquad (4.1B)$$

(t-stat) (-2.75) (5.84) (-6.44)

R-squared: 0.85 D W statistic: 1.56

Demand Equation (restricted)

$$\log X^{d}_{\$_t} = -1.91 + 0.75 \log WY_t - 4.44 \log PX_{\$_t} + 5.12 \log PXW_{\$_t} \qquad (4.2B)$$

(t stat): (-0.92)* (1.54)** (-3.61) (5.03)

R-squared: 0.94 D W statistic: 1.86

* insignificant at the 5% level ** significant at the 10 % level

Supply Equation in terms of Maltese Currency

$$\log X^{s}_{\$_t} = 0.66 + 2.2 \log PX_{\$_t} - 1.4 \log CPI_t + 0.29 \log CAF_{t-2} \qquad (4.3B)$$

(t stat) (0.82) (9.42) (-3.7) (2.52)

R-squared 0.98 D W statistic 1.65

Supply Equation in terms of US $

$$logX^{s}_{\$_t} = 3.54 + 2.27 logPX_{\$_t} + 2.8 logEN_t - 1.46 logCPI_t + 0.26 logCAF_{t-2} \qquad (4.4B)$$

(t stat) (4.04) (9.93) (7.42) (-3.98) (2.35)

R-squared 0.98 D W statistic 1.98

4.7 Conclusion

The various estimations reported above showed that Maltese exports are determined by simultaneous interaction of several variables. As such the determinants of Maltese exports should be estimated by Simultaneous-Equations Estimation Technique because Ordinary Least Squares would yield biased estimates. OLS estimation underestimated the price elasticities while it overestimated the foreign income elasticity. The relatively high value of the elasticities of Maltese exports may be attributed to the extreme openness of Malta's economy.

CONCLUSION

This Paper showed how important model specification is in estimating the demand elasticities of exports. The supply side of exports has generally been addressed only by assumption. The assumption that exports supply is infinitely elastic has led to single-equation estimation of demand elasticities to yield biased estimates. It underestimated price elasticities of demand and overestimated the income elasticity of demand in Malta's "clients".

It was argued that the Supply of Maltese exports of manufactures is not infinitely elastic. A supply function was thus specified and estimated simultaneously with the export demand function. The results obtained from the simultaneous equation model estimation of Maltese manufactured exports showed that the volume of Maltese exports is determined by simultaneous interaction and that the price of exports is not exogenous to the system. Price elasticities of demand turned to be higher than those obtained from single-equation estimation while the impact of "World" income (whose effect was measured by the foreign income elasticity), turned out to be weaker.

In the "small country" case world income has little influence on the volume of manufactured exports and in any case, relatively large(r) price elasticities indicate that what predominately determines the volume of exports is Malta's ability to compete in world markets on basis of price. This is consistent to the concrete view of Maltese exporters that what matters for them is to be competitive on the international market on the basis of price, at all times so that even during recessions they can keep their share of the market. In fact while growth of the "world" income generates higher demand for imports and hence higher demand for Maltese exports, Maltese exports do not seem to suffer as badly as "world" income does in periods of weak aggregate demand in Malta's clients. This can safely be attributed to the competitive edge that Maltese exporters have on competitors.

Maltese exporters, therefore, do the right thing when they do their utmost to keep their prices as low as possible in order to remain competitive (be it through domestic price level, the exchange rate and other factors which were not

quantified and directly treated in this Research such as labour productivity and technology). This competitiveness stimulates foreign demand for Maltese exports. Higher demand can be satisfied by higher production which is influenced by the price of exports, by the level of domestic prices and by productive capacity.

Once the export sector remains in a healthy shape, exporters can ascertain themselves of a certain level of profitability through which they can lower their prices in order to remain competitive or to increase their competitiveness as well as to further their investment to avoid capacity constraints. The interaction of all these factors determines the volume of Maltese exports - the degree of which depends on the various parameters estimated in this Research.

The relatively high price estimates produced in this research, likewise, have relevant policy implications. If Maltese policy makers aim at raising the volume of Maltese exports in order to safeguard income and employment, they have to bear in mind that this could be achieved mainly through improving export competitiveness. It has been shown that this could be achieved through the appropriate exchange rate policy and price policy. Small countries which generally have a relatively large foreign trade sector are not in a position to influence economic conditions in the rest of the world. However they are in a position to influence the relative price of their exports which depend on the price elasticities of demand for Maltese exports. This implies the importance for such parameters to be estimated as accurately as possible.

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MALTA: Gross Domestic Product at factor (current) cost by Broad Economic Sectors % 1955–1990

Year	Manufact.	onstruct. & Quarr.	Market Services	Agric. & Fisheries	Govt.	British Mil. Ser.	Property Income	GDP at fc
1955	8.29	8.40	33.33	5.65	13.10	24.85	6.38	100
1956	8.89	8.51	35.89	5.82	11.92	23.26	5.71	100
1957	8.21	8.02	36.81	6.09	12.09	23.08	5.70	100
1958	8.13	9.16	35.07	7.24	12.66	22.33	5.41	100
1959	16.38	7.47	32.85	7.05	13.47	17.49	5.29	100
1960	16.16	7.79	31.99	6.96	14.08	17.74	5.28	100
1961	15.71	6.78	32.51	7.40	15.54	17.16	4.90	100
1962	15.97	6.11	32.35	7.53	16.17	16.88	4.99	100
1963	16.81	6.19	32.33	7.78	16.33	15.46	5.10	100
1964	18.02	5.32	33.86	7.29	16.90	13.14	5.47	100
1965	19.33	5.46	33.30	7.53	17.20	11.75	5.43	100
1966	22.12	5.73	32.86	6.96	17.15	9.97	5.21	100
1967	19.67	6.63	33.96	7.06	18.47	8.95	5.26	100
1968	20.33	6.26	33.09	7.32	18.90	9.09	5.01	100
1969	22.39	6.76	33.42	7.35	18.36	7.72	4.00	100
1970	21.73	7.55	31.20	7.07	21.65	6.95	3.85	100
1971	20.19	6.36	32.20	7.15	21.73	7.20	5.17	100
1972	24.58	4.93	29.22	7.42	20.37	6.25	7.23	100
1973	26.48	4.44	28.95	7.26	19.36	6.12	7.39	100
1974	28.38	5.21	29.29	7.00	19.27	5.00	5.85	100
1975	30.52	6.01	28.83	6.02	18.40	4.21	6.01	100
1976	32.44	5.21	29.06	6.03	18.03	3.27	5.96	100
1977	33.01	4.79	30.63	5.86	17.47	2.54	5.70	100
1978	33.61	4.64	32.31	4.52	17.39	1.57	5.96	100
1979	34.04	4.61	33.58	3.93	17.17	0.13	6.54	100
1980	33.09	4.49	35.08	3.81	17.23	-	6.30	100
1981	31.08	4.37	33.72	3.85	19.23	-	7.75	100
1982	29.93	5.64	31.21	4.01	19.26	-	6.95	100
1983	28.78	5.64	34.56	4.49	18.81	-	7.72	100
1984	29.59	4.66	33.64	4.59	19.24	-	8.28	100
1985	29.48	4.82	34.25	4.50	18.77	-	8.18	100
1986	29.16	4.09	33.42	4.42	21.01	-	7.90	100
1987	27.53	4.25	33.65	4.32	22.40	-	7.85	100
1988	27.00	3.93	34.64	3.89	23.26	-	7.28	100
1989	27.42	3.73	34.70	3.74	22.91	-	7.50	100
1990	27.04	3.52	35.63	3.47	22.49	-	7.85	100

Source: National Accounts of the Maltese Islands, COS, various issues.

MALTA: Employment by Broad Economic Sectors as a % of Total Employment

	1955–1959	1960–1964	1965–1969	1970–1974	1975–1979	1980–1984	1985–1989
Manufacturing	11.6	18.2	21.3	27	31.3	25.33	23.6
Const & Quar.	6.7	8.6	10.7	8	4.2	4.94	4.2
Market Services	26.2	28.4	29.8	30.4	30.8	27.03	25.9
Agric & Fisher.	10.1	8.9	7.3	6.3	6.4	3.08	2.7
Government	19.7	19.6	20.6	22.9	25.2	39.62	43.7
Brit Mil Ser	25.6	16.2	10.3	5.3	2.1	...	...
Employment	100	100	100	100	100	100	100

Source: Reproduced from Briguglio L "The Maltese Economy" (1981)
and updated by the present author from National Accounts Data of Malta.

MALTA: Sales of Large Manufacturing Establishments
(selected years, Lm 000s)

INDUSTRY		1987	1988	1989	1990	1991	1992
Tobacco	Dom Exports	3920	1992	1342	1283	1087	706
	Local Sales	10226	10729	11801	12403	8980	13434
Textiles, Footwear, Clothing	Dom Exports	64976	61075	62545	68199	64708	70119
	Local Sales	15445	14587	13557	11113	10921	9746
Wood & Furniture	Dom Exports	164	293	501	1208	1194	1186
	Local Sales	5806	6872	7612	8319	9351	10099
Paper & Printing	Dom Exports	9563	10981	8347	14975	16708	17861
	Local Sales	8143	8537	8448	9793	12095	13883
Leather & Rubber	Dom Exports	6479	7445	8246	8373	9543	11741
	Local Sales	359	177	296	137	421	417
Chemicals	Dom Exports	4871	5588	7365	9604	9754	11406
	Local Sales	10315	11577	12505	10217	14708	14599
Non-Metals	Dom Exports	350	411	282	425	500	671
	Local Sales	8757	8983	9633	10979	14590	16608
Metals	Dom Exports	6446	7536	9182	11985	8747	6720
	Local Sales	5615	7021	7168	8198	9388	10600
Machinery	Dom Exports	71924	100377	145048	168854	214583	276745
	Local Sales	...	...	...	10111	4095	4229
Transport	Dom Exports	7743	13358	14194	10008	1095	4751
	Local Sales	5379	2627	5810	5886	1291	968
Miscellaneous	Dom Exports	12862	16872	16306	15376	20366	31895
	Local Sales	8436	1982	3201	5524	4308	5266

Source: Economic Surveys, Malta, various Issues

APPENDIX 3.1

COMPUTATION OF WY

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
BELGIUM														
GDP cur pr BF Bn	691.00	773.00	842.00	905.00	970.00	1038.00	1151.00	1281.00	1402.00	1569.00	1782.00	2091.00	2313.00	2633.00
GNP deflator(85=100)	29.00	30.00	32.00	33.00	34.00	35.00	36.00	38.00	40.00	42.00	46.00	51.00	58.00	62.00
GDP (85=100)	2382.76	2576.67	2631.25	2742.42	2852.94	2965.71	3197.22	3371.05	3505.00	3735.71	3873.91	4100.00	3987.93	4246.77
BF/US$ (wf)	49.86	49.75	49.64	49.83	49.68	49.93	50.14	49.65	48.59	44.02	38.98	38.95	36.78	38.61
GDP 85 pr Bn US$	47.79	51.79	53.01	55.04	57.42	59.40	63.77	67.90	72.13	84.87	99.39	105.26	108.43	110.01
Share BELUX Ex in Tot Ex	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Y*(B, wtd)	3.86	4.19	4.28	4.45	4.64	4.80	5.15	5.49	5.83	6.86	8.03	8.51	8.76	8.89
FRANCE														
GDP 85 pr Bn FFr	2171.80	2313.50	2424.10	2550.50	2670.00	2783.90	2978.20	3148.90	3299.60	3445.80	3633.10	3746.10	3735.70	3894.10
FFr/US$ (rf)	4.94	4.94	4.94	4.94	4.94	4.94	5.19	5.55	5.54	5.05	4.46	4.81	4.29	4.78
GDP 85 pr Bn US$	439.89	468.59	491.00	516.60	540.80	563.87	573.37	566.94	595.32	682.38	815.00	778.15	871.56	814.84
Share France Ex in Tot Ex	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Y*(F, wtd)	11.72	12.49	13.09	13.77	14.41	15.03	15.28	15.11	15.87	18.19	21.72	20.74	23.23	21.72
GERMANY														
GDP cur pr DM Bn	382.40	420.20	459.20	488.20	494.40	533.30	597.00	675.30	749.80	823.10	917.30	983.90	1026.60	1120.50
GNP deflator(85=100)	39.70	40.90	42.40	43.90	44.50	45.60	47.40	51.10	55.10	58.00	61.60	65.90	69.80	72.30
GDP (85=100)	963.22	1027.38	1083.02	1112.07	1111.01	1169.52	1259.49	1321.53	1360.80	1419.14	1489.12	1493.02	1470.77	1549.79
DM/US$ (rf)	4.00	4.00	4.00	4.00	4.00	4.00	3.94	3.66	3.49	3.19	2.67	2.59	2.46	2.52
GDP 85 pr Bn US$	240.81	256.85	270.75	278.02	277.75	292.38	319.40	361.07	389.82	445.07	557.18	576.95	597.80	615.49
Share Germany Ex in Tot E	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Y*(G, wtd)	98.83	105.41	111.12	114.10	113.99	119.99	131.08	148.18	159.98	182.65	228.66	236.78	245.34	252.59
ITALY														
GDP It l TR (85=100)	363.88	374.06	386.28	409.40	438.79	467.51	496.02	522.37	522.56	545.08	583.83	615.53	599.19	636.67
ItL/US$ (wf)	625.00	625.00	625.00	625.00	625.00	625.00	625.00	625.00	619.90	583.20	583.00	650.30	652.80	832.30
GDP 85 pr Bn US$	582.21	598.50	618.05	655.04	702.06	748.02	793.63	835.79	842.97	934.64	1001.42	946.53	917.88	764.95
Share Italy Ex in Tot Ex	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Y*(I, wtd)	51.98	53.43	55.18	58.48	62.68	66.78	70.85	74.61	75.26	83.44	89.40	84.50	81.94	68.29

COMPUTATION OF WY

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
NETHERLANDS														
GDP (85=100) Bn of DFl	191.20	206.20	217.60	223.90	236.10	251.40	282.60	298.70	311.30	321.60	336.60	350.00	349.70	367.60
Dfl/US$ (wf)	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.50	3.21	2.80	2.69	2.53	2.64
GDP 85 pr Bn US$	52.82	56.96	60.11	61.85	65.22	69.45	78.07	82.51	88.88	100.20	120.40	130.19	138.28	139.04
Share Netherlands Ex in T	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Y*(G, wtd)	3.78	4.08	4.31	4.43	4.67	4.98	5.59	5.91	6.37	7.18	8.63	9.33	9.91	9.96
UK														
GDP (85=100) UK STG	218.01	229.87	235.75	240.23	245.75	255.73	260.99	267.00	272.32	281.89	302.39	297.22	294.96	303.10
US$/UK Stg (rh)	2.80	2.80	2.80	2.80	2.77	2.40	2.40	2.40	2.42	2.50	2.45	2.34	2.22	1.81
GDP 85 pr Bn US$	610.43	643.64	660.10	672.64	679.92	613.75	626.38	640.80	660.21	705.23	741.52	695.20	655.34	547.46
Share UK Ex in Tot Ex	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Y*(UK, wtd)	181.10	190.95	195.83	199.56	201.71	182.08	185.83	190.11	195.87	209.22	219.99	206.25	194.42	162.42
USA														
GDP 85 pr Bn US$	2093.10	2211.30	2334.20	2474.60	2538.80	2643.20	2715.00	2713.90	2798.10	2932.10	3084.50	3065.10	3040.20	3190.40
Share USA Ex in Tot Ex	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Y*(USA, wtd)	51.32	54.22	57.24	60.68	62.25	64.81	66.57	66.55	68.61	71.90	75.63	75.16	74.55	78.23
WY	**402.60**	**424.77**	**441.04**	**455.46**	**464.36**	**458.47**	**480.36**	**505.96**	**527.78**	**579.44**	**652.07**	**641.26**	**638.15**	**602.10**

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
BELGIUM													
GDP cur pr BF Bn	2847.00	3058.00	3265.00	3526.00	3664.00	3983.00	4222.00	4542.00	4858.00	5124.00	5349.00	5707.00	6198.00
GNP deflator(85=100)	67.00	70.00	73.00	75.00	79.00	85.00	89.00	94.00	100.00	104.00	106.00	108.00	113.00
GDP (85=100)	4249.25	4368.57	4472.60	4701.33	4637.97	4685.88	4743.82	4831.91	4858.00	4926.92	5046.23	5284.26	5484.96
BF/US$ (wf)	35.84	31.49	29.32	29.24	37.13	45.69	51.13	57.78	59.38	44.67	37.33	36.77	39.40
GDP 85 pr Bn US$	118.55	138.72	152.55	160.77	124.92	102.56	92.78	83.62	81.81	110.29	135.16	143.72	139.20
Share BELUX Ex in Tot Ex (	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Y*(B, wtd)	9.58	11.21	12.33	13.00	10.10	8.29	7.50	6.76	6.61	8.91	10.93	11.62	11.25
FRANCE													
GDP 85 pr Bn FFr	4019.50	4154.10	4288.80	4358.50	4409.70	4522.10	4553.40	4613.30	4700.10	4818.40	4926.80	5148.50	5367.50
FFr/US$ (rf)	4.91	4.51	4.25	4.23	5.43	6.57	7.62	8.74	8.99	6.93	6.01	5.96	6.38
GDP 85 pr Bn US$	818.04	920.45	1008.09	1031.45	811.41	688.08	597.46	527.89	523.09	695.69	819.67	864.29	841.29
Share France Ex in Tot Ex	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Y*(F, wtd)	21.80	24.53	26.87	27.49	21.62	18.34	15.92	14.07	13.94	18.54	21.84	23.03	22.42
GERMANY													
GDP cur pr DM Bn	1195.30	1283.60	1388.40	1472.00	1535.00	1588.10	1668.50	1750.90	1823.20	1925.30	1990.50	2096.00	2224.40
GNP deflator(85=100)	75.00	78.20	81.20	85.20	88.70	92.60	95.80	97.90	100.00	103.30	105.30	106.90	109.70
GDP (85=100)	1593.73	1641.43	1709.85	1727.70	1730.55	1715.01	1741.65	1788.46	1823.20	1863.79	1890.31	1960.71	2027.71
DM/US$ (rf)	2.32	2.01	1.83	1.82	2.26	2.47	2.55	2.86	2.94	2.17	1.80	1.76	1.88
GDP 85 pr Bn US$	686.30	817.20	932.87	950.49	765.73	695.46	682.12	625.55	619.29	858.30	1051.69	1116.45	1078.57
Share Germany Ex in Tot Ex	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Y*(G, wtd)	281.66	335.38	382.84	390.08	314.25	285.41	279.94	256.72	254.16	352.24	431.61	458.19	442.64
ITALY													
GDP It l TR (85=100)	660.17	684.44	726.41	756.20	760.37	761.99	769.37	790.04	810.58	834.26	860.42	895.40	921.72
ItL/US$ (wf)	882.40	848.70	830.90	856.40	1136.80	1352.50	1518.80	1757.00	1909.40	1490.80	1296.10	1301.60	1372.10
GDP 85 pr Bn US$	748.15	806.46	874.24	883.00	668.87	563.39	506.56	449.65	424.52	559.61	663.85	687.92	671.76
Share Italy Ex in Tot Ex	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Y*(I, wtd)	66.79	72.00	78.05	78.83	59.71	50.30	45.22	40.14	37.90	49.96	59.26	61.41	59.97

APPENDIX 3.1 (cont)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
NETHERLANDS													
GDP (85=100) Bn of DFl	376.10	385.50	394.80	398.30	395.60	389.70	395.20	407.60	418.20	426.60	440.60	452.10	473.20
Dfl/US$ (wf)	2.45	2.16	2.01	1.99	2.50	2.67	2.85	3.09	3.32	2.45	2.03	1.98	2.12
GDP 85 pr Bn US$	153.24	178.18	196.81	200.34	158.54	145.94	138.47	132.04	125.91	174.12	217.51	228.73	223.13
Share Netherlands Ex in Tot	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Y*(G, wtd)	10.98	12.77	14.10	14.36	11.36	10.46	9.92	9.46	9.02	12.48	15.59	16.39	15.99
UK													
GDP (85=100) UK STG	310.21	321.40	330.50	323.42	319.19	324.62	336.50	344.35	357.27	372.04	389.95	407.13	415.73
US$/UK Stg (rh)	1.75	1.92	2.12	2.33	2.03	1.75	1.52	1.34	1.30	1.47	1.64	1.78	1.64
GDP 85 pr Bn US$	541.47	616.93	701.19	752.37	647.29	568.25	510.47	460.15	463.13	545.78	639.09	725.26	681.67
Share UK Ex in Tot Ex	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Y*(UK, wtd)	160.64	183.03	208.02	223.21	192.03	168.58	151.44	136.52	137.40	161.92	189.60	215.17	202.23
USA													
GDP 85 pr Bn US$	3334.30	3494.90	3582.90	3563.70	3626.60	3548.50	3686.50	3914.80	4038.70	4156.40	4284.30	4452.80	4565.60
Share USA Ex in Tot Ex	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Y*(USA, wtd)	81.76	85.70	87.86	87.39	88.93	87.01	90.40	95.99	99.03	101.92	105.06	109.19	111.95
WY	**633.21**	**724.61**	**810.07**	**834.34**	**698.01**	**628.39**	**600.34**	**559.67**	**558.06**	**705.97**	**833.89**	**894.99**	**866.46**

NOTE: Total Maltese Exports to the Main Export Buyers: Belgium, USA, France, Germany, Italy, Netherlands, the UK.
Libya and the USSR had to be left out since important data relating to these countries is missing.

SOURCE: For full deatails regarding datta sources refer to Chapter 3.

COMPUTATION OF PXWUS FOR 1963

Exports (Mn US $ from / to)	Germany	Italy	Belgium	USA	UK
Germany	-	1369.1	1039.3	1050.9	555
Italy	907.1	-	182.8	480	270.2
Belgium	895.7	248.3	-	410.9	277.1
USA	1585.1	1098.1	575.9	-	1223.4
UK	677.7	491.2	415.3	1129.3	-
Cyprus	10.2	4.5	1	1.1	25.5
Greece	56	14.9	5.4	54.9	22.7
Israel	39.6	8.1	20	46.5	48
Tunisia	1.8	21.4	0.5	0.8	5.1
Spain	89.8	70.2	21.2	79	118
TOTAL	4263	3325.8	2261.4	3253.4	2545

EXPORT SHARES					Z	PX$63	PWX
Exports of GER/Tot Exp to Competitor	0.41	0.46	0.32	0.22	1.41	36.1	50.99
Exports of Italy/Tot Exp to Competitors	0.00	0.08	0.15	0.11	0.55	34.6	18.94
Exports of BEL/Tot Exp to Competitors	0.07	0.00	0.13	0.11	0.52	37.8	19.65
Exports of USA/Tot Exp to Competitors	0.33	0.25	0.00	0.48	1.44	28.1	40.39
Exports of UK/Tot Exp to Competitors	0.15	0.18	0.35	0.00	0.84	30.4	25.46
Exports of Cyprus/Tot Exp to Competitors	0.00	0.00	0.00	0.01	0.01	46.5	0.68
Exports of GREECE/Tot Exp to Competitors	0.00	0.00	0.02	0.01	0.05	51.9	2.38
Exports of ISRAEL/Tot Exp to Competitors	0.00	0.01	0.01	0.02	0.05	29.2	1.57
Exports of TUNIS/Tot Exp to Competitors	0.01	0.00	0.00	0.00	0.01	19.3	0.18
Exports of SPAIN/Tot Exp to Competitors	0.02	0.01	0.02	0.05	0.12	48.7	5.95
					5.00		166.18
							33.23554

NOTES

Z = Sum of Export Shares of a country

PX$63 = Export Unit Value

PWX = Z * PX$

PWX 1963 = Sum of PWX / Sum of Z

SOURCES:
SEE CHAPTER 3 FOR FULL INFORMATION

MALTA: Time-Series Data Used in the Estimations

YEAR	Yr	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
GDP 85 prices	GDPco	94.9	96.9	103.6	114.8	122.7	135.1	143.8	162	165.9	175.6	192.8	212.1	253.6
PXW HOUTHAKKER $ (ex Yugo & Tur)	PXWUS	33.24	33.47	34.23	35.09	35.50	33.40	36.59	38.39	40.81	45.09	54.68	67.50	75.29
World Income (fixed wt 1976)	WY	402.60	424.77	441.04	455.46	464.36	458.47	480.36	505.96	527.78	579.44	652.07	641.26	638.15
Malta Export Unit Value $ terms	PXUS$	42.6	44.4	45.6	44.5	42.2	39.4	41	46.1	46.4	55	62.8	76.3	81.3
Exports Value Index	PXLm	32.4	33.8	34.70	33.90	32.60	35.00	36.40	40.90	40.20	44.70	49.40	62.70	66.70
Exports Volume Index	XVOLI	8.3	9.1	10.60	13.40	13.00	17.40	20.40	17.40	22.30	28.60	38.30	40.20	44.80
Unit value of Imports	MVALI	23.70	24.60	25.40	24.80	26.40	27.50	28.10	29.70	30.60	33.30	41.50	56.70	60.50
Value of Exports Lm M (85 prices)	VALEXLmco	15.18	19.93	24.93	31.71	30.34	40.43	43.85	39.29	46.82	57.54	72.79	82.26	95.80
Val of Exports US$ M 85 prices	VALEXUSco	35.21	42.79	52.63	67.42	63.98	86.29	92.68	84.60	99.14	123.64	156.05	175.62	201.72
CPI 1985=100	CPI	39.6	40.5	41.1	41.3	41.6	42.5	43.5	45.1	46.1	47.7	51.3	55.1	59.9
GFCF 85 prices (manuf sector)LmM	GFCFMco	3.26	3.93	3.55	4.14	5.43	5.64	6.58	8.41	6.62	6.19	7.34	7.29	11.72
GFCFM machinary manuf at const pr.	GFCFMAC	2.09	3.60	3.24	3.69	4.97	5.15	6.16	7.41	5.47	5.08	5.80	6.73	11.47
Index of Indus Prod (Manuf) 85=100	IPI	16.04	17.39	19.14	22.47	22.44	24.92	28.02	28.89	27.17	30.43	39.11	41.5	45.77
Exchange rate US$/Lira	EXRUSLm	2.8	2.8	2.8	2.8	2.7667	2.4	2.4	2.4	2.4569	2.6095	2.7232	2.5947	2.6202
Exchange rate Lira/US$	EXRLmUS	0.36	0.36	0.36	0.36	0.36	0.42	0.42	0.42	0.41	0.38	0.37	0.39	0.38

(continuation of series)

YEAR	Yr	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
GDP 85 prices	GDPco	296.7	332.9	370	408.9	437.7	452.2	462.5	459.7	464	476	494.5	514.8	558.1	603.8
PXW HOUTHAKKER $ (ex Yugo & Tur)	PXWUS	73.41	81.00	92.95	108.63	123.34	112.81	108.87	104.73	99.95	100.00	118.88	136.40	143.20	142.24
Y* (fixed wt 1976)	WY	602.10	633.21	724.61	810.07	834.34	698.01	628.39	600.34	559.67	558.06	705.97	833.89	894.99	866.46
Malta Export Unit Value $ terms	PXUS$	82	85.6	102	118.5	128.3	122.9	118.8	106.3	101.4	100	122.3	145.8	168.5	167.4
Exports Value Index	PXLm	74.30	77.10	83.80	90.50	94.50	101.30	104.30	98.00	99.70	100.00	102.50	107.40	118.80	124.30
Exports Volume Index	XVOLI	63.90	80.10	83.00	89.70	93.60	92.30	85.30	85.50	97.70	100.00	104.40	105.40	108.40	130.40
Unit value of Imports	MVALI	65.70	71.50	75.90	85.60	92.50	102.20	103.30	103.30	101.40	100.00	96.20	96.80	97.90	101.00
Value of Exports Lm M (85 prices)	VALEXLmco	131.10	157.96	157.46	168.14	176.42	171.50	162.07	159.95	181.91	187.10	189.92	194.22	198.59	236.85
Val of Exports US$ M 85 prices	VALEXUSco	278.05	337.62	335.29	357.81	376.46	365.34	345.96	341.49	388.56	400.00	406.38	414.95	423.74	504.18
CPI 1985=100	CPI	60.2	66.3	69.4	74.4	86.1	96	101.6	100.7	100.2	100	102	102.5	103.4	104.3
GFCF 85 prices (manuf sector)LmM	GFCFMco	10.16	16.49	14.30	23.76	25.33	29.11	24.93	23.42	26.46	30.58	22.82	27.03	32.10	39.41
GFCFM machinary manuf at const pr.	GFCFMAC	9.82	14.75	12.61	21.54	22.83	21.87	19.18	17.59	23.06	27.20	19.92	23.76	28.72	36.31
Index of Indus Prod (Manuf) 85=100	IPI	53.9	64.18	67.81	71.52	86.66	87.72	89.08	90.24	98.04	100	110.88	114.53	124.75	146.95
Exchange rate US$/Lira	EXRUSLm	2.3534	2.3688	2.5974	2.7911	2.8962	2.5894	2.4282	2.3135	2.1718	2.1385	2.5481	2.8981	3.0251	2.8712
Exchange rate Lira/US$	EXRLmUS	0.42	0.42	0.39	0.36	0.35	0.39	0.41	0.43	0.46	0.47	0.39	0.35	0.33	0.35

* Some of the series pertain to foreign prices

Source: See Chapter 3