THE IMPACT OF A DEPLETING INDUSTRY ON A DEVELOPING ECONOMY: THE CASE OF THE COPPER INDUSTRY IN CYPRUS

BY

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INTRODUCTION

A. The Nature of the Study. This study is intended to be an inquiry into the extent of the impact of a depleting industry on a developing economy. With this aim in mind, I have divided the paper into four chapters. I first try to define "export economy" as a theoratical concept, then to look into the static and dynamic properties of an export economy which distinguish it from a self-sustained developing economy, and finally to test some of these properties with a practical case --that of Cyprus.

Simple tools of economic analysis are employed, most of them well-known, but some less popular. Among the latter is the concept of "returned value" developed by C. W. Reynolds.[1] This concept is used to determine

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[1] For a detailed discussion see Alasdair I. MacBean, Export Instability and Economic Development (London: George Allen & Unwin Ltd., 1966), pp. 179-186.

the share of total value of production of the export industry which is retained in the domestic economy; it has been found useful in developing a measure of the absolute and relative participation of the export industry in the domestic economy, and a measure of the relative gains from trade using a "returned value terms of trade" index.

B. Purpose of the Study. As already stated the practical motive for this study is to attempt a measurement of the impact of an export industry on a developing economy, namely the impact of the copper industry on the economy of Cyprus. Such a measurement would indicate the extent to which the Cypriot economy would be affected from the depletion of the copper industry which has a remaining useful life of five to seven years.[2]

It is suggested that such a measurement may provide a framework for the analysis of problems faced

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[2]Willard L. Thorp, Cyprus-Suggestions for a Development Programme (New York: United Nations, 1961), p. 39.

by many of today's developing countries which may be characterized as export economies. These regions which often possess vast natural resources, are subject to the investment programs of foreign capital and the fluctuations of the world market for the growth of export industries upon which much of their economic development must depend.[3]

C. Scope of the Study. Beyond its general theoratical consideration of the export economy, this study has limited itself to the analysis of one case --Cyprus and the large scale copper industry. Cyprus was chosen for the relative availability of statistical data and for its dependence upon copper as major exports. However the statistical material available refers to the mining sector as a whole. The approximations resorted to and the inadequate lenght of the time series limit the reliability of the results. The reader is reminded of this at appropriate points in the text.

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[3] Hla Myint, The Economics of the Developing Countries (New York: Frederick A. Praeger, 1964), pp. 26 - 29.

No attention has been paid to the strictly monetary problems facing the export economy,[4] nor is there any attempt to develop a macro-economic model using the export industry as an exogenous factor in economic growth.[5]

Furthermore, the paper does not consider the long and colorful history of the Copper industry in Cyprus except when it is relevant to the topic under consideration,[6] nor does it treat the relationships between other export industries and the development of the economy.[7] The external market structure of the

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[4]These are reviewed at length in Henry C. Wallich. Monetary Problems of an Export Economy (Cambridge: Harvard University Press, 1960); and David Krivine, Fiscal and Monetary Problems in Developing States (New York: Frederick A. Praeger, 1967).

[5]For a discussion of this topic see Charles P. Kindleberger, Foreign Trade and the National Economy (London: Yale University Press, 1962), Douglas C. North, "Location Theory and Regional Economic Growth," Journal of Political Economy, LXIII (June, 1955), 243.

[6]See David Lavender, The Story of Cyprus Mines Corporation (San Marino: The Huntington Library, 1962).

[7]See A. J. Meyer and Simos Vassilion, The Economy of Cyprus (Cambridge: Harvard University Press, 1962).

export industry is not emphasized,[8] nor is the financial aspect of large scale mining.[9]

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[8] See United Nations, Economic and Social Council, Commission on International Commodity Trade, Trends in International Trade in Major Minerals (E/CN. 13/L.74, April 12, 1963), also Nations Unies, Counseil Economique et Social, Commission Economique pour l'Afrique, Rapport Sommaire sur l'Etude Preliminaire des Possibilites d'Implanter des Industries du Cuivre, du Plomb et du Zinc en Afrique de l'Ouest jusqu'en 1980, (27 Mars 1967).

[9] See Paul M. Tyler, "Cost of acquiring and Operating Mineral Properties," Economics of the Mineral Industries, ed. Edward N. Robie (New York: The American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., 1959), Part I.

CHAPTER I

THE NATURE AND SIGNIFICANCE OF THE EXPORT ECONOMY

A. Definition of the Export Economy and the Export Industry.

(1) Definition of the Export Economy. An "export economy" may be defined for purposes of the following analysis as an economic entity which receives a significant share of its product from one industry selling in an external market.[1] A national economy with a dominant raw material or primary product-producing sector is generally chosen as the typical example. Our example is Cyprus, with copper currently providing about 6% of the GNP. Other economies could as easily be selected, such as Iraq where petroleum provides about 47% of the GNP.[2]

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[1] Jonathan V. Levin, The Export Economies: Their Pattern of Development in Historical Perspective (Cambridge: Harvard University Press, 1960), p. 2.

[2] International Monetary Fund, International Financial Statistics. (Vol. XX, Number 12, December 1967), p. 171.

(2) Export economies may be classified according to their export industries' relative share of gross domestic product and total value of exports of the economy. Four cases are given below in diminishing order of importance.

a. The export industry dominates the domestic economy (over 10% of GDP)

   The export industry dominates export earnings (over 50% of total exports)

b. The export industry is important in the domestic economy (between 5 and 10% of GDP)

   The export industry dominates export earnings (over 50% of total exports)

c. The export industry is important in the domestic economy (between 5 and 10% of GDP)

   The export industry represents a significant share of exports (20 to 50% of total exports)

d. The export industry is important in the domestic economy (5 to 10% of GDP)

   The export industry represents a non-negligible share of exports (below 20% of total exports)

The fourth category seems to point out the definitional boundary between an "export economy" and an economy which merely relies heavily on exports.

It will be shown subsequently that the Cypriot copper industry has fallen for the past ten years in the third category.

(3) It is not difficult to see why typical export economies are developing economies. Since these countries tend to have smaller Gross Domestic Product, it is relatively easy for one major industry to dominate not only foreign trade but also the total domestic output. As these economies grow, one might expect the export industry to diminish in relative importance, even though it grew in absolute magnitude, as other sectors developed at a more rapid rate, and especially as new industries were introduced.[3]

The dominance of the export industry in most Middle Eastern countries (oil in Iraq, cotton in Syria and the United Arab Republic, etc.) may be said to be less a function of the lower stage of development of the economy than of the peculiar natural resource endowment of the region. It may be stated, therefore, that while capital flows to these economies from abroad to support export industries, this does not automatically create an expansionary effect

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[3] W.W. Rostow "The Stages of Economic Growth", Studies in Economic Development, ed. Bernard Okun, and Richard W. Richardson (New York: Holt, Rinehart and Winston, 1961) p. 191.

on effective demand, raising yields and bringing forth a multiplication of other industries which will permit the region to follow a path of sustained economic growth.[4] As a result, the typical "export economy" is a developing economy in the sense of the relatively low per capita income and product, relatively unproductive domestic industry, considerable disguised unemployment, and circularities and indivisibilities so often cited in the literature on economic development.[5]

(4) Definition of Export Industry. The main characteristic of the "export industry" is its service of a foreign market, rendering the demand for its product (except where a noticeable foreign trade repercussion exists) independent of the behaviour of the local economy or its policy makers. This industry may be one of many

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[4]The reasons for this are discussed in International Economic Association, The Economics of Take-off into Sustained Growth, ed. W.W. Rostow (London: Macmillan and Co. Ltd., 1963)

[5]See in particular Stephen Enke, Economics for Development, (Englewood Cliffs: Prentice-Hall, Inc., 1963) Chap. II, Norman S. Buchaman and Howard S. Ellis Approaches to Economic Development (New York: The Twentieth Century Fund, 1955) Part I, P.T. Bauer and B.S. Yamey The Economics of Underdevelopped Countries (Cambridge: Cambridge University Press, 1957) chap. V and VI. This would not apply to "new developing economy" such as Kuwait.

types, varying with respect to capital, management, factor requirements, product produced, structure of the industry, geographical location within the local economy, etc.

(5) The export industry will be likely to present the following characteristics:

a. Large scale capital investment.

This is because economies of scale tend to operate for raw material and primary producing industries of the type which dominate export economies.[6] Also substantial investment in social overhead capital such as railways, roads, town-sites, hospitals and schools often have to be erected in developing areas by those investing in the export industries,[7] attaching far greater capital inputs to a given industry, per unit of output, than one would expect in a more developed economy.

b. Concentration of ownership.

This is due to the economies of scale mentioned previously, which cause a tendency toward consolidation of holdings.[8] The absence of an anti-trust philosophy facilitates this phenomenon. However, exceptions to this rule arise in the instance of export industries such as agriculture where substantial economies of

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[6]Murray D. Bryce, Policies and Methods for Industrial Development (New York: McGraw-Hill Book Company, Inc. 1965) p. 73.

[7]For Cyprus Mines Corporation, the major foreign producer in Cyprus, see Lavender op. cit.

[8]Bryce, op. cit., p. 74.

scale do not always exist (cotton production) and where concentration is most effective at the marketing rather than producing stage.

c. Concentration of marketing power.

The advantages of administrative pricing over a more competitive industrial structure are generally seized upon by export industries either through the state, or through private producers' cooperatives.

d. Production of raw material or primary products.

The special physical and/or climatic circumstances of many developing countries give them a comparative advantage in the production of raw materials and primary products which is recognized by foreign investors looking for profitable ventures and/or for vertical integration of their overseas operations.[9] The limited investment in education and vital elements of social overhead capital which provide the bases for efficient manufacturing enterprises added to the limitations of the domestic market due to low real per capita income tend to discourage investment in manufacturing.[10]

e. Exportation of the greater share of output of the export industry.

This is caused by the limited effective demand of the domestic population for the product of the export industry relative to the large size of the industry.

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[9]Adamiantios Pepelasis, Leon Mears, and Irma Adelman, Economic Development (New York: Harper & Brothers, 1961) pp. 19-20.

[10]Paul Alpert, Economic Development (London: Collier-Macmillan Ltd., 1963) p. 42.

f. Employment of modern technology.

This is a function of the scale of the industry, the necessity of its competing in the world market, the tendency of most extractive industries to be subject to relatively fixed factor proportions which are capital intensive, the important role of foreign engineers in development of export industry,[11] and management by foreign owners familiar with recent developments in technology abroad.[12]

g. Employment of local labor.

Except for skill levels in which labor is extremely scarce in the export economy, the industry will tend to take advantage of the differential in real wages wherever possible.[13]

h. Employment of foreign managers and technicians.

This is especially characteristic of export industries in developing countries not sufficiently advanced to prepare local citizens for positions requiring a high level of technical competence.[14]

i. Foreign ownership.

The large scale capital requirements necessary for export industries possessing economies of scale, often make local capital inadequate to supply the investment requirements for efficient operation. As a result substantial foreign capital inputs are needed.

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[11] Bryce, op. cit., p. 84.

[12] This is obvious in the case of the petroleum industries in the Arabian Gulf.

[13] Myint, op. cit., pp. 53-55.

[14] Bryce, op. cit., p. 85.

j. Higher productivity of labor than the rest of the economy.

This is a logical consequence of a high capital-labor ratio for the export industry, the use of modern technology, the servicing of a larger market than the domestic economy, with accompanying economies of scale.[15]

k. Higher productivity of capital than the rest of the economy.

This is a result of the foregoing reasons.[16]

l. Major source of foreign exchange for the economy.

This follows from the definition of the export economy presented in Section A, (1) and (2) above.

m. Wide fluctuations in sales, profits, and production.

This is the demonstrated characteristic of industries producing raw materials or primary products, and it is contended that these are the most characteristic type of "export industries" in "export economies."[17]

n. Exportation of large share of earnings.

This is a result of the dualistic nature of the capital structure of the economy in which

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[15] Gerald M. Meier International Trade and Development (New York: Harper & Row, 1963) p. 94.

[16] See in particular Paul Rosenstein Rodan, "Notes on the Theory of the 'Big Push'", Economic Development for Latin America, ed. H. Ellis (London: Macmillan & Co. Ltd., 1961) chap. 3.

[17] United Nations, Department of Economie Affairs, Instability in Export Markets of Underdeveloped Countries (E/2047/Rev. 1 ST/ECA/15, Sept. 1952) (New York, 1952).

yields of the export industry are substantially greater than those of other industries in the domestic economy. It is also a function of the nature of foreign ownership which invests in the export industry for reasons of vertical integration with industry abroad.[18]

o. Subject to political as well as economic developments of other countries.

This is a result of the servicing of a foreign market, the employment of foreign capital, and the use of foreign technicians and managers.[19]

All of the above characteristics will be tested in terms of their relevance to the Cypriot copper industry. Each characteristic has its own implications for the integration of the export industry into the domestic economy.

The most significant characteristic of the export industry is that the major part of its product is marketed outside the economy. Thus the behaviour of demand for the product is to a large extent independent of the behaviour of the domestic economy. By the same criterion, the export economy becomes vulnerable to the international trade cycles and is most of the time unable to influence changes

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[18] Bryce, op. cit., p. 86.

[19] Kindleberger, op. cit., p. 219

in the market for its product through domestic policy. Proceeds of the industry may be, therefore, regarded as exogenous to the system.

The industry generally provides the major source of foreign exchange for the economy and is thus crucial to its capacity to import and to any economic growth based on imported goods. In this study the "export industry" will be considered as a separate entity, distinct from the rest of the export sector due to its size and nature.

B. Analysis of the Impact of the Export Industry on the Export Economy.

(1) The analysis of the impact of the export industry on the export economy might begin with a simple static model showing the degree of integration of the industry into the economy. Several alternatives are available here including input-output models, national income models, and domestic expenditures model. The nature and purpose of these models are discussed briefly below:

a. Input-output model. This model would show the export industry as one row and column in a typical input-output table describing the structural relationships

between basic industrial sectors of the export economy. Such a model would make it quite easy to show the impact (on the supply side) of an increase in demand for exports on the total level of output in the system. Also it would be possible to show the share of final demand in the system provided from factor income derived from the export industry. Finally it would show to what extent the domestic economy participated directly in the product of the export sector. This useful technique is not used in this study due to the lack of familiarity of the author with it.[20]

b. National income model. This would show the integration of the value-added component of the export industry into a total value added model of the export economy focussing on the income side of the national income accounts. The payment to foreign factors of production will be balanced in the national accounts by negative net foreign investment. Thus it is evident that the larger the share of payments to foreign factors of production, the smaller the gross national product of the export economy.

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[20] Those interested in application of the input-output techniques to Cyprus are referred to Simos Vassiliou Input-Output Analysis of the Economy of Cyprus (offset print manuscript, Harvard Center for Middle Eastern Studies, 1959). It would be a worthwhile attempt to translate the input-output data available (for 1954 and 1957) into a linear programming model.

c. Domestic expenditures model. This model balances total product of the export industry, as represented by sales plus net inventory change, with payments to domestic factors for operating expenses direct taxes, duties, net profits paid to local owners of the export industry, and other miscellaneous charges plus all payments to foreign factors of production, expatriated profits, and indirect taxes and depreciation. It also separates out local purchases on capital account by the export industry as reflecting payments to local factors of production attributable to the export sector.

This model may be used to determine the amount of foreign exchange provided by the export industry (provided all of its product is sold outside of the domestic economy) by summing domestic operating expenditures, domestic investment expenditures, taxes, duties, net profits paid to local owners of the export industry, and miscellaneous local charges. While the functional impact on the economy cannot be measured as easily as it might have been either through the input-output model, or the factor payment model, at least a break-down is available in terms of current and capital expenditures within the domestic economy (which presumably could be broken down into more detail in terms

of specific factor payments if such were desired.)

The convenience of this model lies in the availability of data in the accounting department of export industries, which are likely to earmark the use of foreign exchange for operating and investment expenditures for a given period, as well as for taxes, duties, and other charges. Therefore, using this "expenditure model" an estimate can be made of "returned value" (see below) of the export industry to the domestic economy without requiring detailed information regarding payments to local and foreign factors of production. A limitation of this model is that it does not deduct from the value-added of the export industry inputs from other domestic industries. As a result it provides us with a "gross value added" representing the value of production of the export industry including not only the output of that industry, but also the share of output of all industries representing its inputs. Nevertheless, in the case of a vertically integrated export industry such as the Cypriot copper industry, this is of minor importance. This model applied to the Cypriot copper industry has been

stated formally in chapter III, Part A.[21]

(2) The Concept of Returned Value. Any of the three models listed above may be used to determine that proportion of total value of production of the export industry which is retained in the domestic economy.

a. As far as the export economy is concerned, it has by definition little or no demand for the product of its major industry. The export industry exists to export the services of local factors of production (land, labor, raw materials, and capital) embodied in its product. In this respect the industry differs from all others in the economy. Here all export industries are alike in kind, but differ in the degree to which they represent outlets for services of local factors of production.

Factor services which are exported in the form of a product (which may be a good or a service) receive this payment in monetary flows back into the economy from the

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[21] A different version of this model (applying to export industry foreignly owned) is found in C.W. Reynolds. "Development Problems of an Export Economy (Ph.D. dissertation, Department of Economics, University of California at Berkeley, 1962) and C.W.Reynolds, "Domestic Consequences of Export Instability", American Economic Review, LIII (May, 1963), p. 93.

rest of the world. The money represents real purchasing power as a compensation for the exported services of land, labor, raw materials, and capital. The role which this real purchasing power (i.e., the "returned value") plays in the economic development of the export economy is the significant factor in our study. Upon its nature, extent, and distribution depends the degree to which the factors whose services are being exported will be affected by the depletion of this industry.

In terms of the capacity of the economy to import, and the balance of payments, the relevant factor is the returned value (assuming that all proceeds of the export industry are derived from abroad). So the importance of the "returned value" relative to total value of the export industry cannot be overstated, not only in terms of static structural relationships of the system, but also in terms of its stability conditions, and dynamic development properties. These factors will be elaborated in parts (C) and (D) below.

b. Institutional factors altering the significance of returned value. If one were to conceive of an export economy with a given GNP (Y), a given total value of production (V), and total returned

value of production (R), by altering the institutional setting of the export industry within the economy, one could very substantially affect the impact of any given R on a given Y, or the ratio of R to V. For example, given V,R and Y, on export industry located near population centers would be expected to have a much higher multiplier effect of $R(\frac{dY}{dR})$ than if the export industry were located in some remote section of the country such as is the case for all the three major Cypriot copper mines.

In other words, on the demand side, one would expect a greater multiplier effect (and possible inflationary impact) on the economy if factor payments from the export industry were quickly channeled into the domestic market through geographical proximity of the industry to commerce and population centers. On the supply side, one would expect a greater share of domestic inputs in the domestic industry where that industry was located close to center of population and commerce (i.e., a higher $\frac{R}{V}$) than if the export industry were remote from the centers.

Moreover the type of industry will largely determine the composition of domestic factor inputs. If the industry is highly labor-intensive, the domestic multiplier

would probably make itself felt through factor payments to labor and resulting consumption, whereas in a highly capital-intensive export industry (except in the cases where capital is locally owned) the multiplier effect through factor payments would probably be minimal.

The point of this discussion is that no matter how much more significant R may be than V in measuring the potential impact of the export industry on the economy, a high R/V may in a given case be a necessary but not a sufficient condition for growth. Only if the institutional structure and behaviour of the economy are such that returned value will be utilized in capital formation will returned value be effective in producing a positive rate of growth.

C. Analyzing the Stability of the Export Economy.

(1) Causes of Instability. Instability is a basic phenomenon of the export economy. Much of this is due to the nature of the export industries upon which the economy is based, being mainly sellers of raw materials or primary

products. It is well known that the price of these commodities tend to fluctuate very widely in the world market[22] as a reflection of relatively inelastic demand, long periods of gestation, volatile climatic conditions, and the inventory policies of prime users.[23] The fact that output instability is accentuated by price instability causes the export industry's total value of production to fluctuate widely over relatively short periods of time, having a resulting impact on returned value and investment in the export sector.[24]

(2) Effects of Instability. The effects of export fluctuations on those engaged in the export industry itself depend upon the extent to which the variations in the export proceeds are actually passed on to the various groups engaged in it. This in its turn depends upon (a) the wage system in force (b) the extent to which the export income recipients are devoted to international trade, that is, the importance of export earnings in their total income and

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[22] United Nations, "Instability of Export Markets of Underdeveloped Countries", op. cit.

[23] Alpert, op. cit., p. 56.

[24] H. Wallich, "Stabilization of Proceeds from Raw Materials Exports" in Ellis (ed.), op. cit. chap. 12, pp. 342-350.

(c) the ability of the persons engaged in the export industry to shift into some other means of earning income.[25]

(3) Measurement of Instability.[26] Instead of measuring the traditional fluctuation of export prices, in net barter terms of trade (index of export prices over index of import prices), the author will use the "returned value terms of trade".

This measure uses as numerator an index of the total returned value of the export industry, divided by the total quantity of units sold by the export industry, and as a denominator the import price index.[27] where the units of the export industry are not homogeneous a standard unit would have to be calculated. The returned value terms of trade, then, provides a measure of the component of the unit value of exports which is returned to the domestic economy.

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[25] Levin, op. cit., pp. 187-190.

[26] For a full discussion see Seymour E. Harris International and Interregional Economics (New York: McGraw-Hill Book Company Inc., 1957) pp. 43-47.

[27] Reynolds, "Development Problems of an Export Economy", op. cit., p. 18.

The extent to which returned value as a whole, or returned value per unit of production, fluctuates determines the amount of instability in the export industry which is passed on to the economy. Owing to the components of returned value (especially tax payments being a function of profits of the export industry) it is quite possible that the returned value terms of trade could show an improvement while the net barter terms of trade[28] shows a decline for a given period.

D. The Export Industry as a Determinant of Economic Growth.

(1) Defining the structure of the export industry with respect to competition, factors inputs, ownership, relationship to the local government, and type of product produced, is a necessary step in analyzing the dynamic role of any export industry. These factors will influence the behaviour of the industry as a determinant of economic growth in the system through the following steps:

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[28] We are referring to the simple net barter terms of trade where the numerator is just the index of the price of the major export commodity rather than a weighted average of the price of all exports.

a. Local participation in total value of production of the export industry through returned value (participation in V through R).

b. Channeling returned value into domestic capital formation (channeling R into I.) The extent to which R is directed into capital formation will depend upon the components of R i.e., payments for local labor, capital, land, taxes, duties, etc., and the marginal propensity to invest of recipients.[29]

c. Multiplier effects of local expenditure for capital formation in the export industry stimulating additional investment (channeling C into I.)

d. Effecting external economies through the export industry.[30]

However for this to take place, the pre-conditions necessary for economic growth must exist, including the existence of social overhead capital, adequate investment in education, an entrepreneurial elite, and an adequate resource pattern.[31] It is not the purpose of this study to describe the background conditions necessary for economic growth. Our attention will be directed to a few basic questions concerning the export industry as a

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[29] V.K.R.V. Rao, Essays in Economic Development, (Bombay: Asia Publishing House, 1964) pp. 35-36.

[30] Marcus Fleming "External Economies and the Doctrine of Balanced Growth," The Economic Journal, LXV (June 1955), 241.

[31] W.W. Rostow, The Stages of Economic Growth (Cambridge: Cambridge University Press, 1960) pp. 17-35.

determinant of economic growth. A brief discussion of these relationships follows, with an attempt to quantify them for the Cypriot economy in Chapter III.

(2) Export Earnings as a Determinant of Domestic Capital Formation. A number of models have been suggested which relate total exports of an economy to domestic investment and the latter to changes in gross national product for an economy with an important foreign trade sector.[32] All these models try to find a relationship between total export earnings and domestic economic growth through the impact of export earnings on domestic capital formation. It would be more interesting to determine a relationship between returned value (R) as a component of total export earnings (V) and domestic capital formation.

It is likely that where the export industry is supported by foreign investment, and where it exists with higher productivity than other sectors of the economy, an accelerator type relationship might exist between export earnings and investment in the export industry, but the

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[32] See Kindleberger, op. cit., especially chapter XII.

possibility of this expanding to the rest of the economy with the export industry as a leading sector[33] may be remote. Our problem would be to determine first whether investment in the export sector is a function of total value of production (V) and secondly whether returned value (R) is a function of total value of production (V). The final step will be to determine the extent to which R may be affecting domestic capital formation outside of the export industry.

(3) Dualism in the Export Economy. The relation between economic growth in general and economic growth in particular sectors of an economy has demonstrated extreme disproportionality.[34] This differential rate of growth and accompanying differential levels of productivity, factors payments, and capacity to import which tend to set apart the export sector as an enclave of progress within a subsistence economy has been called dualism in the

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[33] W.W. Rostow "Leading Sectors and the Take-off" "The Economics of Take-off into Sustained Growth." ed. W.W. Rostow, op. cit., pp. 18-19.

[34] W.W. Rostow The Process of Economic Growth, (Oxford: The Clarendon Press, 1960) pp. 261-264.

literature on economic development.[35]

Once again, the concept of returned value may be used to determine the extent to which dualism may be directly attributable to the non-participation of the export industry in the rest of the economy: the larger the ratio of R/V, and the larger the proportion of $C/\bar{C}$,[36] the less important is the enclave aspect of the export sector. In a purely competitive case, the ratio of R/V and $C/\bar{C}$ will depend upon the nature of the production function of the export industry[37] and the relative productivity of domestic factors of production, as compared to importable factors of production. For example, in the case of the copper industry which requires capital-intensive production methods, a subsistence economy with a scarcely developed

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[35] J. Singer, "The Distribution of Gains Between Investing and Borrowing Countries," American Economic Review, LXV (May 1950) p. 248.

[36] C represents local expenditures for construction of plant and equipment; $\bar{C}$ represents total expenditures for plant and equipment including imports.

[37] Harvey Leibenstein, "Technical Progress, the Production Function, and Development," The Economies of Take-off into Sustained Growth, ed. W.W. Rostow, op. cit., pp. 185-200.

industrial sector will have little to offer in the way of capital foods inputs.[38]

It is possible in a subsistence economy that the export industry --being in a monopsonistic position with respect to the employment of local factors such as labor-- would be able to pay wages significantly below the marginal revenue product of labor.[39] On the other hand, in a more advanced developing country where local labor is engaged in collective bargaining (specially if supported by the government), wage levels may exceed marginal revenue product due to monopoly in the factor market.

The impact that the export industry will have on the rest of the economy will depend upon the degree of advancement of the rest of the export economy. In many cases the export industry is required to have a much larger degree of vertical integration in a developing country due to the need for self-sufficiency in the production of a

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[38] At some time Cyprus Mines Corporation had to import even the timber necessary for its operations.

[39] For the theory of "cheap labour policy" see Myint, op. cit., pp. 53-68.

number of inputs which would be available from other industrial sectors in a more developed economy.[40] However the use of returned value as a measure of the participation of the export industry in the domestic economy makes it such that the presence or absence of vertical integration will not affect the magnitude of R/V, since whether the export industry produces its local inputs itself, or purchases them from another supplier, the magnitude of R will remain the same.

The tax and duties component of R is obviously the critical variable for most export economies with inherent dualism, since through it, the export economy may be able to participate quite substantially in the total value of production of its key sector. The extent to which the government raises tax revenue and channels them into productive capital formation will determine the extent to which the rest of the economy is able to generate higher levels of productivity and effective demand which will

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[40] It would be interesting in this respect to compare the degree of vertical integration of the petroleum industries operating in Texas, Venezuela and the Arabian Gulf.

mutually interact to narrow the gap between this and the export sector.[41]

In analyzing dualism, then, the first step is to determine the extent to which the export sector is directly contributing to this situation. This may be achieved by determining the ratio of returned value to total value of production (R/V) and local capital expenditures to total investment in the export industry ($C/\bar{C}$). If this ratio proves to be low, it will be evident that high productivity of the export sector is not being channeled into payments to local factors of production and government. Then it may be said that the export industry is directly contributing to the maintenance of this dualism.

If the ratios prove to be high, however, the export sector may be discharged from direct responsibility for sustained dualism. Here the problem becomes one of determining the investment propensities which may be assigned to components of R, both private and public and the

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[41] For the spread effect of the export sector see Gerald M. Meier and Robert E. Baldwin Economic Development, Theory, History, Policy (New York: John Wiley and Sons, Inc., 1957) pp. 224-229.

yields on investment in the rest of the economy.[42] If the export industry is channeling its productivity back into the economy through returned value, the problem then becomes one of using this returned value to create the pre-conditions essential to raise the yields of the rest of the economy, and then to stimulate propensities proportionate with the improved yields.

Look at from this point of view, it becomes apparent that for many economies, growth is conditioned by the stimulation of the export sector, together with the parallel expansion of the domestic industry, where the returned value of the export industry is used as the instrument of savings and real purchasing power so essential to the expansion of the domestic industry.

So we see that a discussion of the dynamic role of the export industry in the growth of the rest of the economy cannot be viewed separately from its static position in the economy (Section B) or the stability properties of returned values (Section C).

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[42] For a detailed analysis of the determinants of propensities and their effect on economic growth see W.W. Rostow The Process of Economic Growth, op. cit., pp. 20-79.

(4) The Export Industry as a "Leading Sector" and the Concept of "Take-off". Prof. Rostow in one of his books[43] develops a theoretical model simulating the growth pattern of a number of economies. The stages of economic growth are five in number. There is first "the traditional society"; the second state is on of transition or the pre-condition stage, then follows the take off (lasting two or three decades); the fourth stage-the drive to maturity- occupies a longer period (around sixty years) and finally comes the era of high mass consumption.[44] The argument briefly stated sees the process of economic development in a given society begin with the establishment of certain necessary pre-conditions for growth followed by a "particular sharp stimulus" which may take the form of a political revolution changing the propensities of the system to respond to opportunities for productive investment, through technological innovation, changing the yields in the system, through a new favorable international environment, or through a challenge posed by an unfavorable shift

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[43] Rostow, Stages of Economic Growth, op. cit.

[44] Ibid., pp. 4-16.

in the international environment requiring import substituting industries.[45]

The stimulus having taken place, according to Rostow's theory, the system may be able to react in terms of a "sustained" process of investment at a higher rate than previously, yielding profits which are substantially reinvested, accompanied by appropriate structural changes such as the development of institutions for the channeling of savings. Such a reaction enable the take-off to occur.

To take place the take-off requires all three of the following related conditions:

a. A rise in the rate of productive investment from 5% or less to over 10% of national income (or net national product).

b. The development of one or more substantial manufacturing sectors with a high rate of growth.

c. "The existence of quick emergence of a political, social and institutional framework, which exploits the impulses to expansion in the leading sector and the potential external economy effects of the take-off and gives to growth an on-going character."[46]

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[45] W.W. Rostow "The take-off into Self-Sustained Growth" The Economic Journal, LXVI, (March 1956), 29.

[46] Ibid., p. 32.

For the economy to move from the stationary pre-take-off level with its low investment/GNP ratio and stable per-capital income to one of sustained growth, it must develop a "leading sector" or "primary growth sector" where "possibilities for innovation and for the exploitation of newly profitable or hitherto unexplored resources yield a growth-rate markedly higher than the average for the economy."[47]

This leading sector will then give rise, during the take-off period, to supplementary growth sectors "where rapid advance occurs in direct response of -- or as a requirement of -- advance in the primary growth sectors" and derived growth sectors "where advance occurs in some fairly steady relation to the growth of total real income, population, industrial production, or some other over-all modestly increasing parameter."[48]

Thus in contrast to a balanced growth hypothesis which supports the idea of a broad parallel development of

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[47] Rostow, "The Process of Economic Growth", op. cit., p. 265.

[48] All quotes taken from Rostow, Ibid.

industry in a developing economy,[49] the Rostovian "stages approach" suggests a concentration of effort in the leading sector as a reaction to a favorable change in yields, followed by supplementary growth in secondary sectors which may in turn give rise to future leading sectors. Rostow goes on to stress that the leading sector in a number of historical cases has been a primary-producing one.

Our concern in this paper is to apply the take-off concept to the Cypriot case. An attempt will be made to determine whether the take-off concept has any relevance to the Cypriot case, and also whether or not the concept of "leading sector" may be applied to the Cypriot copper industry. (See Chapter III)

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[49] Ragnar Nurske, Problems of Capital Formation in Underdeveloped Countries (Oxford: Basil Blackwell, 1960) pp. 11-31.

CHAPTER II

THE CYPRIOT COPPER INDUSTRY - AN IDEAL CASE

A. A Brief History of Large Scale Copper Mining in Cyprus.

The calculations presented in Chapter III illustrate in terms of the available statistics, the relationship between total value of production and returned value in the copper industry, and between returned value and the economic development of Cyprus. For that reason, the historical summary will be necessarily brief and pertain only to those important institutional developments which took place and had a significant impact on returned value of the industry. The entrepreneurial history of the industry, its market structure, the conditions of demand for copper, and technological change are all considered incidental to this theme. While participation of the industry in the Cypriot economy through domestic inputs has gradually increased over the years, an important

discontinuity in this participation has been registered through higher exploration and development expenditures, as a result of legislation. An attempt will be made in Part A, below, to analyze the impact of such legislation on returned value.

The mining industry in Cyprus is very old. The island was perhaps one of the earliest producers of copper derived by the smelting of sulphides. There even appears to be some relation between the word copper and Cyprus. "The island's chief product became known as chalkos kuprios, a term soon to be changed by the Romans to aes Cyprium or aes Cuprum --the metal of Cyprus."[1]

After the time of the Romans, no important activity took place in Cyprus until 1914, when a large ore body of cupreous pyrites was discovered in Skouriotissa. In 1915 a mining lease was granted by the government of Cyprus to Cyprus Mines Corporation, an exclusively American company. Continuous development work went on in the following years and the first copper was exported in 1922. The 1929 depression caused some hesitation but the industry was soon

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[1]Lavender, op. cit., p. 57.

flourishing. In the 1930's, the two other important copper producing companies, Hellenic Mining Company and Cyprus Sulphur and Copper Company Ltd., started operations. With the Second World War European markets were closed and practically all mining operations in Cyprus were stopped. After the war, mining was resumed and then began a period of tremendous growth. Minerals exports rose in value from £ 1,000,000 before the second world war to nearly £14,000,000 in 1956.[2]

With the prospect of profitable mining ahead the companies were able to embark on extensive development after the war, not only in additions and extensions to plant and machinery, but also in improving the living conditions of employees. At Pendayia, Cyprus Mines Corporation operates a well equipped hospital. Until recently the Company's welfare services included clinics, welfare centers, children's clubs and villages social centers in several of the villages.

The inter-communal troubles which erupted in armed conflict early in 1963 closed all operations down for a

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[2]Thorp, op. cit., p. 38.

short period and it was not until mid-April 1964 that operations started up again.

Not only ore reserves are difficult to estimate, but ore reserves which would be profitable to extract at one price will not be worth moving at some lower price. Estimates in terms of years of life also depend upon the rate of operation. Still, there seems to be consensus on the fact that the mining industry in Cyprus has passed its peak.[3] However, the trend of events can be changed by the discovery of new ore bodies. It is to encourage such new discoveries that the Income Tax (Foreign Persons) Law 1961 was adopted.

Mining is governed by the Mines and Quarries (Regulations) Laws, Cap. 270, and the Mines and Quarries Regulations 1958,[4] under which the ownership and control of all minerals and quarry materials, are vested in the Republic. Prospecting is not restricted, provided the provisions of the prospecting permits are carried out. Prospecting permits for metallic minerals are granted for areas up

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[3] Ibid., p. 39.

[4] Mines and Quarries, Chapter 270 of the Laws, 1959 Edition, Government of Cyprus.

to two square miles for a year with a maximum total holding of 50 square miles. The annual rent is £12 and carries an obligation to spend a minimum amount of £100 per square mile per year.

It seems clear that it should be an urgent obligation of the government to encourage the existing mining companies to carry on extensive exploration work on their mining claims. One way to accomplish this is to allow mining companies to charge the exploration expenses incurred by them during the year against the income of that year. Up till the present, exploration expenses are capitalized and then amortized over the entire life of the mine. If these exploration expenses were incurred in a venture which proved to be unproductive, the expenditure could be deducted from income only in the year following that in which the search is given up.

Since the corporate income tax bears a flat rate of 42.5 per cent, the exact timing as to when a deduction can be taken would not affect the total tax payment over the period presently used for capitalization. However, if the corporations could take its tax deduction in the same period in which money was disbursed, carrying on exploration

would no more be such a heavy financial burden.[5]

Prospecting permits would be readily granted but the mining legislation should try to prevent inactivity on the part of the prospecting companies; exploration area should be reduced after two years [6] to fifty per cent of the original claim. The rent charged per square mile might be on a rising scale and the obligation for expenditure for prospecting might be increased to £250 per square mile per year.

The mining industry of Cyprus needs to be revitalized by the investment of additional capital in the economy of the country. Without added investment the production of copper will decline sharply during the next few years;[7] this could cause a great reduction in the government revenue from income taxation and therefore in returned value. The Government's task must be therefore to create a favourable climate for investment in mining.

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[5] Thorp, op. cit., p. 40.

[6] Prospecting permits are granted for a maximum (but extendable) period of four years.

[7] Thorp, op. cit., p. 40.

An important factor in influencing investment is taxation. This is particularly true in connection with mining in Cyprus since much of the activity is carried on by foreign companies which have alternative uses for their capital in other countries.

The taxes now applied to mining companies in Cyprus take the form of the payments of royalties and an income tax. Royalties fixed before 1958 were applied in some cases on the basis of 25 mils per ton and in others at 1½ per cent of the value of the ore. In 1958, the following schedule based on value, was established.

Copper precipitated from waters issuing of draining from a mine	2½% of value
Copper precipitated from other solutions	2% " "
Copper concentrates	1½% " "
Cupreous pyrites[8]	1% " "

As to the income tax, its severity must be measured not only by looking at the rate but also at the nature of the deductions which are allowed in connection with the

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[8] L.M. Bear, The Mineral Resources and Mining Industry of Cyprus (Cyprus: Ministry of Commerce and Industry, 1963) p. 20.

determination of net profits. The suggestion has already been made as to how to improve the treatment of exploration costs as a deduction. Like the exploration costs, the development costs should be given better treatment. Now the development costs are capitalized and prorated over the life of the mine. Under this formula the companies are encouraged to postpone exploration and development. The discovery of new and additional reserves may prolong the period over which past expenditures can be amortized and thus reduce the annual deductions. If current deductions were permitted, the amount of capital which the company would have to invest would be somewhat smaller. The only danger in such a policy is that, if there suddenly were very large exploration and development expenses, government revenue might suffer a temporary reduction. If such an unusual situation seems likely, a limit could be placed on the percentage by which the net profits for tax purposes could be reduced in any one year by such deductions.

Another aspect of taxation which is important to mining companies is an allowance for depletion. In view of the need of the mining industry for more capital and the fact that the taxation of mining profits in Cyprus was higher than in many other countries, the government introduced

a depletion allowance law which was published on 5th March, 1959, in Supplement No 5 of the Cyprus Gazette (No 4217).[9] The purpose of this change was to put Cyprus on a more competitive basis with other countries. The bill, which came into force in 1960, provides a rather unusual formula for calculation of the depletion allowance; it is computed on a sliding scale from zero to ten per cent of the net proceeds. The net proceeds are the gross income less royalty and delivery costs such as shipping and insurance. The sliding scale is based on the ratio of profit to net proceeds whereby the higher the ratio of profitability, the lower the allowance. In no case can the depletion allowance exceed twenty per cent of the profits.

It is logical that any step taken to reduce the cost of production of the mines in Cyprus will put the country in a stronger position in relation to its competitors in the world markets. This process raises certain problems. In order to lower costs, it is often necessary to increase the output through increased efficiency of labor and with the help of mechanization. It is unfortunate that the depletion allowance instead of encouraging efficiency, penalizes it by not allowing any depletion to firms having a

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[9] Cyprus Gazette, Supplement No. 5, March 5, 1951.

profitability rate of 80 per cent and above. This discrimination forces the efficient companies not to put extra effort in favor of more efficient methods of production which have so much advantage for the country's competitive position in mining. The companies prefer to extract smaller output below the optimum level, because their efficiency is penalized. They carry on with their old equipment because the depletion allowance indirectly subsidizes the inefficient and directly and unfairly penalizes the efficient.

A final method for bringing tax arrangements to bear upon the maintenance and development of the mining industry is to provide special arrangements to attract new mining companies to Cyprus. The government might allow mining enterprises the possibility of amortizing, during the first three years of mining operations, as much of their mining investment as their profits would permit. This type of inducement has been effective in the Philippines, Northern Rhodesia and other countries.[10]

B. The Significance of the Cypriot Copper Industry as an Export Industry.

As it now exists, the large-scale copper mining in Cyprus consists of three companies which are called

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[10] Thorp, op. cit.; p. 41.

A, B, and C in this study, The Cyprus Mines Corporation (A) and the Cyprus Sulphur and Copper Company Limited (C) are both foreignly owned with headquarters respectively in Los Angeles and London. The Cyprus Mines Corporation is at present operating four mines located in the western part of Cyprus --Skouriotissa (recently reopened), Mavrovouni, Apliki (started in February 1966) and Lefka "A" (started in September 1966). The Cyprus Sulphur and Copper Company Ltd., a subsidiary of the Esperanza Copper and Sulphur Company of London, operates an opencast mine at Limni. The life of the Limni Mine is considered to be 5 years i.e., until 1972. The third large firm, the Hellenic Mining Company Limited (B), is a local company with connections in Greece and the United Kingdom. The principal properties, at present being mined, are Kalvasos-Asgata, Mitsero-Agrokipia and Mathiatis.

It is an understatement to say that these three companies dominate the local copper industry. Their mines now in operation account for more than 99% of Cypriot Copper production at the present time. While medium scale mining is inexistent and small scale mining is expanding, it is still insignificant compared to that of large-scale copper mining.[11] The three companies utilize modern

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[11] Ibid., p. 42.

technology and may be said to engage in intensive rather than extensive mining. The labor employed is of local origin, with local and some foreign management.

A test of the significance of large-scale copper mining in Cyprus as an ideal case of an export industry will now be made by comparing it with the characteristics of an "export industry" cited in Chapter I. These characteristics are the following:

a. Large-scale capital investment.

Company A had a declared capital of $19,582,000 and total assets for $137,251,660 in 1965, Company B had a declared capital of £150,000 and total assets for £4,910,440,[12] while no information was available to the author with regard to Company C. The advantages of economies of scale are obvious in intensive copper mining, where up to 99 times as much over-burden and ore must be removed for every pound of copper. In this industry the advantages

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[12] It should be pointed out that company A & B have interests in numerous subsidiary companies. The figures presented are taken from their consolidated balance sheets for 1965. However the major part of their activities is their Cyprus operations in copper mining.

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of vertical integration from mining to concentration are mainly those of insuring a smooth flow of production without costly bottle-necks which may be used by others to extract monopsonistic or monopolistic profits from producers or processors. Compared to agriculture and manufacturing, this extractive industry may be said to be extremely capital-intensive. (Reference to capital/labor ratio in Chapter III)

In addition to the need for a large initial investment in plant and equipment evidenced by companies A,B and C, a substantial investment in social overhead capital was also necessitated at the beginning and through the life of each operation. In the case of the mines at skouriotissa and Mavrovouni the first item of necessity was a town-site, since the ore bodies were located remote from centers of population in the barren mountain reaches. All supporting facilities for the towns were constructed by the companies including houses, schools, stores and a hospital.[13] The

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[13] At Pendayia, Cyprus Mines Corporation operates one of the largest and best equipped hospitals of Cyprus. Until recently the Company's welfare services included clinics, welfare centers, children's clubs and village social centers in several of the surrounding villages; a milk company has, also, been provided.

only railways in Cyprus are the two operated by Company A to haul ore from Skouriotissa and Mavrovouni to the mill at Xeros over distances of seven and three miles respectively. These facilities are listed as investment expenditures by the companies; while they are indirectly productive in making available a large and comparatively healthy and well-educated work force, they are not immediately profitable and account for greater capital intensity of production for extractive industries such as copper (normally remote from population centers) than for other types of export industries (e.g., the citrus industry in Cyprus).

b. Concentration of ownership.

This is a characteristic of Cyprus's large-scale copper mining, where the eight ore bodies used in the past forty-five years were owned by three companies. In each instance, production by a number of smaller companies would have been considerably less efficient, and probably not profitable (Company B despite its size was suffering losses for a certain number of years).

At Troulli, for example, a small mining operation that started production in 1956 after 29 years of exploration, revealed itself not profitable and was surrendered

to Cyprus Mines Corporation in August 1962.

c. Concentration of marketing power.

The product of Companies A, B and C is marketed by them. Sales are done by special contracts and Cypriot copper usually by-passes the New York or London market. This is obviated by the fact that about 80% of production is exported to Western Germany, Italy and the Netherlands.

At no time in the history of large-scale copper mining has the government of Cyprus fostered an anti-trust or anti-cartel policy to encourage increased competition among the domestic sellers of copper.

b. Production of raw materials or primary products.

The profits obtained from large-scale copper production in Cyprus have attracted continued investment in Cyprus' copper mining. However future prospects for the industry are rather dim, even though the country has not yet been completely mapped geologically. In recent years considerable investment has been made in the manufacture of consumer goods as import substitutes, but the greatest productivity is still to be found in the production of

primary products.

The limitations of effective demand for more than staple commodities for most of the population and the relatively small size of the population (643000) restrict profit potential in terciary industry. This in turn prevent the establishment of a substantial secondary industry providing producers goods.

Today the share of copper sales in total exports of Cyprus is less than a decade ago, and the returned value from copper production as a share of Gross Domestic product is less than 10 years ago. Nevertheless, there is little question that historically and still at present, Cyprus' greatest comparative advantage lies in the production of this commodity.

e. Exportation of the greater share of output of the export industry.

In Cyprus almost 100% of the production of large-scale mining of copper is exported and nothing is retained in Cyprus for continued processing. The Cypriot economy is not capable of using even a tiny fraction of the commodity for which it has the greatest comparative advantage. To the extent that large-scale copper production

continues to be profitable and offers future prospects, foreign capital invested in the country will gravitate toward the raw materials producing sector.

The forward and backward linkages which the raw material producing industries have created in the Cypriot economy (see Chapter III) could hardly suffice to generate sufficient domestic demand to relieve the economy from considerable dependence on foreign trade. This is understandable since the population size and natural resource endowment as well as the social overhead and industrial capital structure and investment in human capital are not sufficient to offset the country's existing productive potential in copper.

f. Employment of modern technology.

In contrast to some larger mines in other less-developed countries (such as Northern Rhodesia), Companies A, B and C utilize the most modern technology in almost all phases of their operation. This includes every type of mechanization in both open-pit and underground mining including block-caving in the latter. Company's A acid and leaching plant constructed between 1950 and 1952

employed the most modern technics and machinery at the time, and operations at Xeros (Company A) includes such up to date techniques as greater utilization of gyratory crushers and rolls (more efficient than ball mills), and fully mechanized flow of concentrates. A minimum of pick and shovel work is employed in all of the three operations with conveyer belts, trucks, and railroads used to transport the ore and concentrates.

The relatively high cost of Cypriot labor in large-scale mining, plus the experience of the companies in the use of modern and efficient equipment, appears to have contributed to the employment of modern technology in Cyprus.

g. Employment of local labor.

It has been estimated by the author that approximately 90% of the total payroll of the three companies goes directly to workers whose permanent home in Cyprus. This has been the case as far back as the records are available. The differential in wages between Cypriot and foreign contract employee has been a source of friction and accounts for the gradual replacement of contract personnel with

Cypriot employees. On the lower levels Cypriot workers have been employed almost exclusively from the beginning. Nevertheless the wide differential between wages of copper workers and wages in the rest of the Cypriot economy, and the narrow differential between wage costs of Cypriot workers and wage costs of workers in the developing countries copper industries, have encouraged the use of modern capital-intensive production methods in all three Cypriot operations at almost every stage of the production process.

h. Employment of foreign managers and technicians.

This was more true of large-scale mining in its early days than it is today, since there has been a gradual substitution of Cypriot for foreign technicians and staff personnel as the Cypriot and Middle Eastern educational system has advanced to supply these needs. The reason for the decrease in the proportion of Americans and British personnel is that they demand relatively high initial wages and non-wage benefits (including travel back and forth to the country of origin, availability of credit to buy consumer goods, company payment of import duties on these goods) and superior housing; also there is general

dissatisfaction among foreign contract workers with the lower standard of living and isolated life of the copper mines, and problems arise associated with changes in cultural environment and language barriers.

Nevertheless, top management is still staffed primarily with Americans, and key decisions are made almost exclusively by Americans and Britishers (in Companies A and C). So important are Cypriot workers to the industry on all levels of operation and management that it is conceded by many officials that the Cypriots could take over and operate the companies (A and C) at the present level of production without considerable disadvantage. However, the economy is far from being able to provide the technical assistance in depth or the ties of marketing and distribution essential to the continued modernization and growth of this vertically integrated industry (these are, by the way, some of the problems facing Company B).

i. Foreign ownership.

Two of the three companies engaged in large-scale copper mining are foreignly owned (companies A and C). The third originally Greek owned has been donated to the Greek community of Cyprus in 1960. Any control which

Cyprus exercises over the foreign companies is through political rather than economic ties. As previously mentioned, the need for outside financing is due to the economies of scale realized in extensive copper mining and the scarcity of capital available domestically for such ventures. No domestic pressures for the assumption of ownership of large-scale copper mining was seriously felt even though some attempts have been done through political channels rather than through the private capital market. (The communist party in the island has been asking for the nationalization of the industry)

j. Higher productivity of labor than the rest of the economy.

This has been characteristic of the copper industry throughout its history, and it is especially true in recent years due to the employment of modern technology and capital-intensive production methods. Thus while less than one percent of the Cypriot labor force is employed in the copper mines,[14] these mines account for approximately 6%

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[14] See Chapter III-C for employment figures. In 1966 around 3500 workers were employed in large-scale copper mining.

of the Cypriot gross national product. To the extent that wages follow the classical model, the higher marginal productivity of the worker in the copper mine may be said to account in part for his relatively higher wage, and the lumpiness of capital inputs in large scale copper-mining creates discontinuities which prevent marginal productivity in large-scale copper mining from approaching that in other domestic industries.

k. Higher productivity of capital than the rest of the economy.

It has been impossible for the author to arrive at any estimate of the marginal efficiency of investment in copper for any of the three companies. This has been because of lack of information and reticence on the part of top management to divulge the necessary information to arrive at this compution. However, from informal discussions with some of the responsibles, it was clear that the marginal efficiency of investment in copper has differed quite remarkably over time and among the three companies. The yields of the skouriotissa and especially Mavrovouni operations have exceeded that of the Kalavasos or Mitsero-Agrokipia, both in good times and bad. Also the newly opened Apliki mine, has not shown a significant profit

since its inception, although much of this is attributed by management to the early writte-off of exploration and development costs.

Since most new operations (Apliki, Lefka "A") are undertaken by the Cyprus Mines Corporation, this would imply that once a large corporation has been attracted to an underdeveloped country through the promise of very high differential in yields over the domestic economy, it may continue to invest in new projects with lower expected yields as a result of greater familiarity with the economy, previous establishment of necessary overhead facilities and lines of supply and communications, social overhead investment, and greater knowledge of the area (with a correspondingly lower discount for risk.)

1. Major source of foreign exchange for the economy.

In the decade ending in 1962, large-scale copper mining in Cyprus accounted for approximately 50% of foreign exchange earned by the Cypriot economy. However, this has fallen to 28% in 1965 and 33% in 1966. Thus we see that the export industry dominated but is still a significant share of foreign exchange earnings, which is a necessary condition for the existence of an "export economy"

as we have defined it in Chapter I, Part A. Also in the Cypriot case, the export industry is important in the domestic economy, accounting for a significant share of GNP (averaging 10% during the 1950's.).

m. Wide fluctuations in sales, profits, and productions.

It is the nature of the copper industry and the world copper market to exhibit very strong cyclical fluctuations in price, dollar volume of sales, quality sold and produced, and profits earned. Thus it is not surprising that this also has been the pattern for Companies A, B and C in the Cypriot economy. The significance of wide fluctuations in profits where more than 35% of returned value is accounted for by direct taxation of profits, is that the absolute participation by the Cypriot economy in its most important industry is extremely unstable. It would be interesting to see whether a series on returned value would show more or less year to year fluctuations than a series on total value of production of large-scale copper mining (this subject is touched upon in Chapter III).

n. Exportation of a large share of earnings.

The greater proportion of the earnings of Cyprus' copper industry, net of taxes, has been expatriated to the United States. Approximately 50% of the net income of the Cyprus Mines Corporation as reported in its financial statements during 1965 was derived from the Cypriot operation. Nevertheless a considerable amount of reinvestment in the existing mining properties has taken place by all three companies.

Moreover, there is little direct investment of copper earnings by the three companies (except for Company B) in domestic industries other than copper, suppliers of its basic inputs, and social overhead facilities directly related to the mines. Only indirectly through taxes, donations, deposits in local banks, etc.., have the companies' earnings been used to broaden the industrial base of the Cypriot economy. This pattern in the past, and the likelihood of its continuance in the future, places an even greater burden upon the Cypriot Government to utilize its share of the returned value for productive capital formation including investment in those projects which would broaden and strengthen the industrial structure of the country.

e. Subject to political as well as economic vicissitudes of other countries.

The political positions of Germany and Italy during the past 25 years has on a number of occasions seriously affected Cyprus' participation in her major export industry. During world war II, the establishment of fascit regimes in both countries forced Companies A and B to close operations.

In the 1950's during the Korean war period, output increased by 3% while total value of copper exported rose by 46%. The same phenomenon happened in 1956 but total value declined after 1956 despite the maintenance of a high level of output.

Each of the above characteristics of large-scale copper mining in Cyprus contributed in the selection of this industry as an ideal example of an "export industry."

CHAPTER III

IMPACT OF THE COPPER INDUSTRY ON THE CYPRIOT ECONOMY

A. Returned Value of Cypriot Copper 1950 - 1966.

Chapter III is devoted to the secular analysis of the impact of the copper industry on the Cypriot economy. The method employed is to develop a simple domestic expenditure model such as was outlined in Chapter I, Part B. The model is designed to demonstrate the share of gross domestic product which is represented by the total value of production of the copper industry and its total investment, and then the rather smaller share accounted for by the returned value of production of the copper industry.

Returned value of the export industry is considered in this study to be one of the most significant exogenous factors determining the level and rate of growth of gross product. That is because returned value

represents payments to local factors of production and to the government (through direct and indirect taxes) which may be reinvested in productive capital formation or spent for current consumption.

In an export economy the magnitude of returned value of the export sector may approximate the total amount of saving in the system (exclusive of the export sector) and thus the volume of gross investment in the system. Where this is the case, and Cyprus provides us with such an instance, it is the export sector which may be regarded as one of the most significant potential sources of funds for productive capital formation. This will be especially true if a large share of returned value accrues to the government, providing a fund of purchasing power which may be used to import capital goods from abroad to increase the resource potential of the system. There is no guarantee, however, that any of the components of returned value will be used for such productive purposes, any more than one can be certain that gross capital formation will be of a highly productive nature rather than representing a redirection of income into luxury housing construction to provide a fund of real wealth as a hedge against inflation.

It is contended in this study that a rational appraisal of the development possibilities of an export economy must take into consideration not only the potential total value of production of investment in the export sector; but more especially the returned value which would be generated by such investment and the repercussions which such returned value will have upon the system in terms of additional productive capital formation. To make such an appraisal, one must separate from the total value of production the returned value component which represents payments to local factors of production on current account as well as tax payments to the government. Once having separated out these elements of the total value of production, it will then be possible to estimate the multiplier effects of such expenditures on the system and especially the marginal propensity to invest on the part of recipients of the factor payments and government tax receipts.

In this study the example of the Cypriot copper industry from 1950 to 1966 is used as a model to illustrate the changing absolute and real magnitudes of returned value as a share of total value of production

and the potential impact which such returned value might have had, as well as the impact which it actually did have, on the Cypriot economy during the past 17 years.

To facilitate this presentation, the use of symbols is relied upon quite extensively. The following are three equations which will serve to define the properties of the domestic expenditures model and the main variables utilized in this study.

(1)

$$V = \bar{p}Q + \bar{p}\,(Qp - Q)^{1} \text{ where}$$

V = total value of production in period t

$\bar{p}$ = average price of copper sold during period t

Q = quantity of copper sold during period t

Qp = quantity of copper produced during period t

$(Qp-Q)$ = net inventory change during period t

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[1] Mr. Bakewell, Assistant Manager at Company A, stated that all what is produced is exported and little inventory if ever is kept, so, for our present study, the "Net inventory change" element can be neglected without impairing the reliability of our results.

(2)

$R = O + C + T + D + M^2$ where

R = gross returned value representing operating and investment expenditures of the export industry in the domestic economy.

O = returned value of local operating expenditures including all payments to local factors of production for current operations.

C = returned value of Capital expenditures including all payments to local factors of production for gross investment (These are called "construction expenses" by the copper companies).

T = all direct taxes paid locally, valued by year of income taxed (rather than by year in which paid).

D = duties on imports paid locally.

M = miscellaneous local expenses.

(3)

$\hat{R} = O + T + D + M$

$\hat{R}$ = net returned value, where

$\hat{R} = R - C$.

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[2]The mining companies in Cyprus are free of import taxes for mining equipment and materials required in their operations.

Having defined the three basic equations for total value of production of the export industry, gross returned value of production and investment of the export industry, net returned value of production of the export industry, it is now possible to show how the relative and absolute magnitudes of these variables have changed over the past seventeen years.

The first significant measure of the potential impact of the export industry on the domestic economy is the proportion of total value of production of the industry to total value of production in the economy (V/GDP). This measure shows us the amount of returned value as a share of Gross Product which would ideally be expected if all inputs in the export industry sector represented payments to domestic factors of production. In the case of the copper industry this would be the absolute limit one could expect from the industry in terms of purchasing power arising from the export of the industry's product. Of course with foreign ownership of the major part of the capital of large scale copper mining, shipping of copper in foreign vessels, refining charges accounting for a considerable share of the value of production, V may normally be expected

to exceed R by a substantial amount. In absolute terms the total value of production of the Cypriot copper industry (expressed in 1950 £) has increased 6% from 1950 to 1966, or at an average annual rate of 0.35% (see column 30 in Appendix). However this increase in the value of production of large scale copper mining began with an output of £ 2.837 million in 1950, increased to £ 4.810 million in 1957 (an average rate of increase of 8.75%), and fell back to £ 3.003 million in 1966 (an average rate of decrease of 6.66%) as a result of the depletion of the major mines.

The impressive increase in the value of production of the Cypriot copper industry in the period 1950-1957 was not matched by growth of the economy as a whole. Gross Product measured in 1950 pounds (column 23) increased at the average rate of 6.50% over the same period. In absolute amounts, Gross Product represented £ 38.7 million in 1950, and 58.8 in 1957. Allowing for an average annual rate of population growth of 2%, Per Capita Product increased at only about 4.50% over this eight year period. On the other hand, in the period 1957-1966, when the value of copper production was declining, Gross product was rising at a sensibly lower rate than in period 1.

The average rate of growth was 3.11% or allowing for the growth in population, an increase of only about 1.10% per year.

The implications of this unhappy fact are that regardless of whatever stimulating effects on the rate of growth the export sector might potentially have had, they were not enough in themselves to generate a significant rate of growth of total or per capita product. Moreover, the share of total value of copper production to Gross Product while fluctuating widely increased from 7.33% in 1950 to 11.34% in 1956 and then felt back to 7.89% in 1966. Nevertheless, it is evident from the statistics that the process of development of the Cypriot economy has not been sufficient to remove it from substantial dependence upon the single major export industry and that the implications of the returned value of that industry to economic growth are, relatively, no less important in 1966 than they were in 1950 (column 24).

Let us now turn to the actual, rather than potential, direct contribution which the copper industry made to the Cypriot economy. This is measured by the returned value component of total value of production (R) which is

defined in equation (2) above. The returned value of production, representing payment to domestic factors of production, taxes and capital formation has increased by 110% over the period 1950-1966. This represents an average rate of growth of 6.4%, a very impressive figure which raises serious questions as to why so substantial a real increase in returned value of copper production did not stimulate a more rapid rate of growth in the Cypriot economy as a whole. In current dollars returned value of production represented £ 3.15 million in 1950; £ 7.38 million in 1956, £ 3.03 million in 1964, and £ 6.55 in 1966 (column 8). In relative terms the returned value of production remained almost constant as a share of Gross Product. (Column 25).

Here a distinction must be made between the actual impact of a high rate of growth of returned value on Gross Product and the potential impact on the system, which was not realized due to leakages in the income stream through imports of consumer goods rather than capital goods, plus low propensities to invest productively on the part of all recipients of R including the government. It is also possible that certain stimulating effects on the economy might have occurred from purchasing power produced by

the export sector, which were offset by adverse effects from other sectors of the economy (e.g. dissaving in industry or agriculture due to a low marginal efficiency of investment based upon low productivities, restricted effective demand, or adverse expectations).

The general problems which beset the Cypriot economy over the period which spanned the great rise of the copper industry (1945-1957) are well documented elsewhere.[3] One of the lessons which the case of copper and Cypriot economic development reveals is that a large and productive export sector is not sufficient to generate a rapid rate of economic growth for the rest of the economy. This will be true if the returned value of production representing payment to local factors of production is only a small share of total value of production. This has not been the case in Cyprus. Thus during the 1950's returned value represented 85% of total value of production and from 6% to 9% of Gross Product. These fact are nevertheless consistent with the argument that the export sector represents an enclave to the domestic economy having no

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[3] Meyer, op. cit.

structural participation in the production or consumption of the rest of the system. If the geographically remote copper mining regions paid income to local factors of production which was immediatly respent on imports of consumer goods and capital goods to be used in the production of commodities to sustain only the population in the immediate area, then the returned value would have little more effect domestically than would its non-returned counterpart. This also has not been the case of the Cypriot economy. That is because import restrictions have increased, domestic transportation has improved, the amount of consumer goods produced locally has increased, and the share of returned value represented by taxation has remained significant up till 1963. Wherever taxes are levied on the export industry by the central Government, a link is created between the "enclave" export sector (to the extent that it is structurally isolated) and the rest of the impact.

In the case of Cypriot copper, taxes have represented as a share of returned value around 41.5% in the 1950's. It is quite clear that although the export industry may appear to be an enclave geographically

employing only a small share of the population (see Chapter II), and providing much of its own social overhead capital as well as importing much of its necessary capital equipment, raw materials, managers and technicians, it nevertheless has been forced to provide, through taxation, an important link with the general flow of income and product of the system.

This section has therefore shown the extent to which total value of production and its returned value component have affected the growth of the Cypriot Gross Domestic product since 1950. The unreflective rate of growth of Gross Product in period I suggested the enclave nature of the Cypriot copper industry. However the lower rate of growth of Gross Product in period II suggested that this enclave nature has been reduced by taxation, enforcement of a "buy local" policy and the replacement of foreign technicians and managers by Cypriot nationals. Nevertheless, the export sector has not in itself proved sufficient to stimulate a rapid rate of growth of the Cypriot economy. One might attribute this in part to the cyclical instability of earnings recognized as characteristic of an industry producing a raw material a primary product for sale in the world market. The stability properties of the

export industry will be examined in part B.

B. The Terms of Trade and Cypriot Copper 1950-1966.

(1) Secular Instability in Terms of Trade.

The preoccupation of less-developed countries with the terms of trade for their major exports is not difficult to understand in the light of the wide fluctuations in price of raw materials and primary products which generally characterize their offerings on the world market. In the case of Cypriot copper it is suggested in this study that apart from all criticisms which may be attached the terms of trade in whatever form they may be stated, a more meaningful measure of the ratio of unit prices of exports to unit prices of imports may be the ratio of returned value of a unit of exports to the price of the unit of imports. (see Chapter I, Part C.).

No matter how much the price of the country's export may improve, decline, or fluctuate relative to the price of imports, only that share of the price which is retained in the country as a payment to the domestic factors of production and in taxes may be meaningfully compared with the cost of imports.

To investigate the effect of changes in the price of copper on the Cypriot economy, the author has used indexes of the "copper terms of trade", "returned value terms of trade," and "barter terms of trade." The definition of each of these follows:

(1)

$$\text{copper terms of trade} = \frac{\text{Price Index of copper}}{\text{Price Index of Import}} =$$

$$\frac{\dfrac{Vt / Qt}{Vo / Qo}}{\dfrac{\sum pit\ qio}{\sum pio\ qio}}$$

(2)

$$\text{returned value terms of trade} = \frac{\text{Index of returned value per unit of copper}}{\text{price Index of Imports}} =$$

$$\frac{\dfrac{Rt / Qt}{Ro / Qo}}{\dfrac{\sum pit\ qio}{\sum pio\ qio}}$$

(3) net barter terms of trade = $\frac{\text{Price index of all exports}}{\text{Price index of imports.}}$ =

$$\frac{\dfrac{\sum_{i=1}^{n} \bar{p}_{it}\ \bar{q}_{io}}{\sum_{i=1}^{n} \bar{p}_{io}\ \bar{q}_{io}}}{\dfrac{\sum_{i=1}^{n} p_{it}\ q_{io}}{\sum_{i=1}^{n} p_{io}\ q_{io}}}$$

where

V = total value of production of copper

Q = total quantity of copper produced (in tons)

p = price of imports

q = quantity of imports

$\bar{p}$ = price of export

$\bar{q}$ = quantity of export

R = returned value of production of copper

t = period t

o = base period

i = all commodities included in the index (1-n) when n commodities are included.

The barter terms of trade for Cyprus have risen over the period under consideration. This picture is improved if one separates from the barter terms of trade the

"copper terms of trade" defined above. This index showed a more impressive improvement from 1950 to 1966, rising by 172% over the seventeen years (column 21). This reflects not only an absolute increase in the price of copper of 203% from 1950 to 1966 (a good year for copper prices), but also a much greater percentage increase than a 14% rise in import prices over the same period.

A still more interesting relationship appears when one regards the index of returned value terms of trade, which improved by 78% over the seventeen year period (column 22). This demonstrates that the Cypriot economy is experiencing a secular increase in its share of copper dollar as well as benefiting by the long-term rise in copper prices. The relatively slower rate of improvement in the returned value terms of trade can be explained in part by the fact that the returned value per pound index climbed by 96% over the period (column 16), while copper prices increased by 200%. Moreover, the government share of returned value represented by direct taxes declined from 36.6 to 16.3% (column 10). These statistics make it quite evident that an effective evaluation of the secular behaviour of the barter terms of trade of an export economy must pay attention not to the "copper terms of trade",

"copper terms of trade" defined above. This index showed a more impressive improvement from 1950 to 1966, rising by 172% over the seventeen years (column 21). This reflects not only an absolute increase in the price of copper of 203% from 1950 to 1966 (a good year for copper prices), but also a much greater percentage increase than a 14% rise in import prices over the same period.

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but to the "returned value terms of trade" as an indicator of the economy's net gain or loss from relative price changes.

(2) More important than the secular behaviour of the terms of trade of the export economy are the effects of the terms of trade upon the stability of the system. Here fluctuations in the index are of particular importance, and it is the contention of this paper that fluctuations in the returned value terms of trade will be of more significance in terms of their cyclical impact on the system than fluctuations in the copper terms of trade. Average fluctuations from year to year are measured in this study, a factor which will certainly overlook the extreme short-run oscillations in the price of copper, but which is made necessary since the data on returned value is available only annually. Thus, for a comparison of fluctuations in the copper terms of trade with fluctuation in the returned value terms of trade, year to year changes are the best which one can achieve with existing information.

In six instances out of thirteen, the average annual percentage change in the returned value terms of

trade exceeded that of the copper terms of trade. However if one goes further back in time it will noticed that generally, the copper terms of trade showed an average annual fluctuation considerably in excess of the returned value terms of trade. This was presumably caused by the larger share of profits (an extremely variable component of V) present in the copper price and a smaller share of direct taxation (a function of profits) in the returned value per unit of copper.

It should be noted that not only does the returned value terms of trade not follow fluctuations in the copper terms of trade by the same magnitude for most of the years, but its pattern also fails to show the same direction of change for many years. In 1952, 1954, 1959, and 1960 the copper terms of trade increased while the returned value terms of trade declined; in 1953 and 1956 the copper terms of trade declined while the returned value terms of trade increased. During these years changes in the price of copper were completely offset (in terms of percentages) by changes in the index of returned value per pound of copper.

Another unstabling effect of the export industry on the domestic economy is the extreme variability in investment in plant and equipment. Considering the little information available, we can infer that the returned value share of investment in plant and equipment which represents payment to local factors of production on capital account have fluctuated very widely in the past. Thus Company A spent on plant and equipment £ 268,649 in 1963, £ 114,751 in 1964, £ 132,430 in 1965, and £ 309,324 in 1966. The reason for these cyclical fluctuations in capital formation is the length of life of capital equipment in the mining industry and the need to completely reconstruct plants as the need arises to move from one mine which is depleted to a new one. The effects of this on the export economy is to provide sporadic inputs of foreign exchange for capital formation which give rise to temporary employment and relocation of the labor force.

Inventory policy of the Cypriot copper industry has had an additional unstabling effect on the system, since periods of falling demand for the red metal have produced contractions in output proportional to the falling demand.

In summary, this section has applied the concept of "returned value terms of trade" to an analysis of the secular behaviour of Cypriot gains from trade due to relative price changes in exports and imports and the components of returned value in the export price. It has been shown that a secular improvement in the copper terms of trade was met with a secular improvement in the returned value terms of trade, but to a much lesser extent, for the same period. It was suggested that a country interested in improving its net barter terms of trade might consider the Cypriot experience and rely more upon the returned value terms of trade than on the copper terms of trade. It can be also noted that a disadvantage exists in terms of cyclical instability if returned value per unit of production is increased through direct taxation. This measure tends to increase the instability of annual increments from the export industry accruing to the domestic economy, since the economy itself will participate more and more in the fluctuations in profits through taxation. It will be suggested in chapter IV that government expenditure policy might be adapted to the cyclical instability of tax receipts from the export sector.

The unstabilizing effect of the fluctuations in the terms of trade of the export economy, passed on and sometimes accentuated through the returned value terms of trade, are enhanced by the unstabilizing effects of domestic capital formation in the export sector. That is because such capital formation tends to occur during periods of relative prosperity of the export industry, which usually coincide with high levels of Gross Product, placing additional strains on domestic capacity during periods when this capacity (at least in bottle-neck sector) is already taxed to the limit. The lack of investment by the export industry in inventory was demonstrated to be an additional unstabilizing factor, tending to accentuate cyclical fluctuations in the demand for raw materials exports. We shall now turn to the share of labor in returned value of the export industry.

C. Labor's Share of Value Added in the Copper Industry 1950 - 1966.

(1) An export industry sells abroad, to a large extent, the services of domestic factors of production. Therefore, the productivity of these factors and the

extent to which the market equates factor prices with marginal revenue product, will be an important determinant in the country's participation in its export earnings.

In the case of Cyprus's large scale copper mining, capital intensive techniques of production have been used after World War II. The number of workers employed has been relatively small compared to the large economic product of the industry, so that the productivity of labor in the copper industry far exceeds that of other sectors of the economy.

One channel through which total value of production in the export industry can be returned to the domestic economy is through wages. If labor's productivity could be shown to rise in the export industry, barring extreme cases of monopsony in the factor market, one would expect real wages to move in the same direction increasing the economy's share of total export earnings.

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In recent years the wages of copper workers have increased significantly in real terms, despite the fact that copper mining consists of only three companies, separated geographically, and ill-disposed to compete

among themselves for the services of labor. Since this is the case, and since productivity of labor is far in excess of any other sector in the Cypriot economy, one might expect a natural monopsony to develop preventing real wages from closely approximating productivity trends.

That the contrary has been true, may be attributable to the development of centrally organized and directed labor unions which are supported in their existence, if not always in their demands, by the Cypriot government. At present the average yearly income of a worker in large scale copper mining approaches 230% the annual per capita income of Cyprus. This, however, was not always the case.

To measure productivity of the workers as it has changed over the period considered in this study, a calculation has been made of the annual pounds of copper produced per employed worker, using the annual average number of full-time employees as the denominator (column 35).

The relationship between real wages and productivity in the export industry is one of mutual

interaction. Substantial increases in productivity of the workers, in a competitive labor market, are likely to give rise to increases in real wages such that the wages in a given skill level will equal marginal revenue product of that skill level. Similarly, pressure for higher wages resulting from the increased demand for labor from other sectors of the economy will cause a shift of labor away from the export industry toward the other (presumably more productive) sectors, until marginal revenue product rises to the equivalent of the new higher real wage.

Neither of these pure cases seems to exist in the Cypriot copper industry. Rather, with oligopsonistic buyers on one hand and oligopolistic sellers of labor services (the unions) on the other, and with no major industry more productive than copper, pressures for increases in real wages appear to have been stimulated by rises in the cost of living and the desire to gain larger shares of the proceeds from copper in the form of real wages. This either encouraged, or occured simultaneously with, the substitution of capital for labor in many aspects of the production process.

It could be argued, although not proved, that pressures for real wage increases tended to outstrip gains in productivity of the copper workers, forcing the company to cut back the number of workers employed in order to bring the marginal revenue product of the remaining work force more closely in line with real wage costs. We see over the long-run an absolute decline in the number of workers employed, so that the increase in real wages has been distributed over a smaller and smaller share of the total Cypriot labor force.

(2) Real wages in the export industry- a hypothetical case. If one were to visualize a hypothetical export economy with one major industry which employed local labor and enjoyed a very high differential rate of productivity from the rest of the economy, and one assumed no changes in technology over the relevant period, the following might result.

As the returned value of the export industry was redistributed through the rest of the economy through factor payments (and possibly taxes) it would (depending

upon the propensities) stimulate additional capital formation as well as increased effective demand. The cumulative effect of these two developments after the gestation period of investment would cause productivity in the rest of the economy to show a gradual rise so that real output would show a secular increase. If population increased at a slower rate than increases in real output, real per capita product would also rise, causing a general increase in real wages, to the extent that pure competition was approximated in the factor markets.

Since we have assumed no changes in technology in the export industry, and if we add the additional assumption that the conditions of demand do not change for the exported commodity, the differential between real wages in the export industry and those in the rest of the economy would tend to narrow. This would be the case (given our assumptions) whenever the export industry generated economic development in the rest of the economy.

As the differential between real wages in the export sector and the rest of the economy narrowed, assuming that productivity of workers in the export industry did not change, there would be pressure on the workers

receiving relatively low real wages in the export industry to move into other sectors where their productivity would now be even greater as a result of general economic growth. This would produce a gradual decline in the number of workers employed in the export industry relative to the total labor force, resulting from the natural forces of economic growth and the development of other sectors of the economy which are equally or more productive than the export sector.

The example above illustrates that there is no cause for alarm simply because the absolute or relative number of workers employed by the export industry shows a secular decline. Alarm should wait until it is determined whether or not the rest of the economy has shown a significant rate of growth so that some sectors employing factors of production similar to those in the export sector will achieve equal or greater productivity.

Another possible cause of change in the number employed by the export industry would be the introduction of new technology independent of the conditions either within the export economy or in the foreign market. This technological change would cause a shift to a com-

pletely new production function which may or may not be more labor-intensive. This was the case of the Cypriot copper industry, which has been very quick to respond to new innovations (frequently of the labor-saving variety) independent of factor price changes.

Finally if we relax the assumption of no changes in the conditions of demand for the exported commodity, fluctuations in demand will certainly have an effect on marginal revenue product of the labor force causing changes in the total number of workers employed, provided that the marginal physical productivity of labor at the outset is greater than zero.

Therefore, taking all the factors into consideration it is conceivable that an increase in demand for the export industry's product may very well have a positive effect on the level of real wages and number of workers employed in the export industry (e.g., the years 1959 and 1966 for the Cypriot copper industry); an introduction of new technology may cause a shift to a new production function which is less or more labor-intensive (although the former has consistently been the case in the Cypriot experience); the decreasing differential in real wages between the export

sector and the rest of the economy due to general economic growth (which may or may not be induced by returned value of the export sector) may cause an absolute or relative reduction in the number of workers employed in the export industry. Finally an increase in the total number of workers available in the economy, greater than increases in productivity, may cause a decline in real wages so that real wages will be permitted to fall in the export industry permitting a larger number of workers to be employed in that sector.

All of these possibilities exist for the export economy depending upon the interaction of various explanatory variables. It is the attempt of this paper merely to illustrate some of the actual events which have affected the number of workers employed in the Cypriot copper industry for the period considered, developing some partial conclusions but no complete answers.

(3) Productivity of Labor for the Industry. Since statistics for the total number of employees in the individual companies for the entire period from 1950 to 1966 are not complete, an estimate has been done for the whole industry over the period under consideration. Columns 35 and 36 in

the Appendix show the results of these calculations and the substantial changes in productivity which they indicate.

A glimpse at the statistics will indicate that over the period 1950-1959 large gains in productivity had been realized. The rise from 1950 to 1959 has been 90% in tons of copper produced per man year. If we multiply this change in average physical productivity by the increase in the price of copper it gives us an increase in the average revenue product of labor of 130% between the two years.[4] This rise in productivity was accounted for not only by a decrease in the absolute number of workers employed from 3,843 in 1950 to 3,133 in 1959, but also by the introduction of newer and more productive methods of technology including a new sulphuric acid leaching plant, and improved power generating facilities.

Productivity losses have been registered for the industry since then. This is mainly attributable to the depletion of known ore reserve and to the fact that the companies are resorting to the exploitation of poorer ore

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[4] As is indicated in Column (5), the price of copper received by the industry in 1950 averaged £123.36 per ton, rising to £178,92 per ton in 1959.

deposits. An interesting point to note is the rise in the number of workers employed that accompanied the fall in their average physical productivity. This may be explained by the fact that while the average physical productivity fell by 40% the price of copper rose by 110% or an increase of 26% in the average revenue product of labor between 1959 and 1966.

(4) Total labor costs for the industry. An examination of total wage costs per worker year realized by large scale copper mining illustrates the cost pressures which have doubtless been essential in the introduction of new production methods and equipment, and reduction in the work force. Column (37) presents the statistics on total labor cost per worker year for the industry for the period under consideration.

This column shows that except for 1957, 1959, and 1960, the labor cost per worker increased at a more rapid rate than productivity so that although productivity (measured in tons produced per worker year) increased by 16.5%, the labor cost per worker increased by 75% over the same period which resulted in the 50% increase in labor cost per ton of copper produced (column 38).

Therefore wage pressures have had a serious impact on the companies who have not hesitated to invest in new machinery and equipment despite the depletion of ore reserves.

(5) Number of workers employed. Despite the increases in the total labor forde in Cyprus, accompanying rather rapid increases in the population, the absolute number of workers employed in copper mining has declined during the years 1950-1966. This decline in the work force has accompanied rapid gains in productivity of labor up till 1959; since then it has been slowed down, despite a falling productivity, by a substantial rise in the price of copper.

An indication of the magnitude of these changes for the industry follows: from 1950 to 1959, the total number of employees declined by 19%, from 3,843 to 3,133.

The explanation for the absolute decline in the number of workers, despite recent changes in this trend, was given earlier as the introduction of new technology of a capital-intensive nature in all three operations. While it is not possible to attribute these changes directly to

secular increases in wage costs occuring as the result of union pressure, it is apparent from the figures that rapid declines in employment occurred for the industry from 1956 to 1959 at the same time that wage costs per worker showed the most rapid increases.

While no statistics are available, it becomes apparent from discussions with certain responsibles that the production workers received the full impact of new technology. For the industry from 1950 to 1966 the number of production workers declined while the number of white collar workers increased slightly.

One of the implications of these disproportional changes in employment is that technological change and increased productivity in the export industry may produce a shift in demand for labor away from lower skills toward higher skills. This is intensified by wage pressures from lower skill levels (more likely to be unionized). Therefore the export industry which relies upon capital-intensive improvements in technology will release (or hire in smaller proportion) workers of the lower skill levels and absorb workers of higher skill levels, including clerical and managerial employees of domestic origin.

Rather than alleviating the characteristic situation of real or disguised unemployment in a developing country, especially in the lower skill levels, this will tend to accentuate the problem. This will be especially true to the extent that domestic managers and technicians are substituted for foreign personnel such as has taken place in the Cypriot copper industry. Where productivity of labor is extremely high in the export sector, this will further intensify the demand pressures on bottle-necks in the supply of labor (highly skilled workers and managers) since the export industry's wages will tend to be substantially higher than those in other sectors of the economy.

(6) Share of Total Labor Cost in Returned Value: 1950 - 1966. As a share of total returned value of copper mining, total labor cost to the industry has shown a secular decline throughout the period. This percentage (estimated in column (11) of the Statistical Appendix) declined for the period from 29.60% to 22.45%. One reason for the declining proportion of wages in returned value was the increasing proportion of operating expenses and investment expenditures as a percent of R over the period.

Despite the fact that the share of total labor cost in returned value has declined in relative terms, the absolute return to labor from copper mining has increased from 1950 to 1966. Total labor costs increased from £ 933,048 at the beginning of the period to £ 1,470,792 in 1966. This reveals a 58% increase in total labor costs returned to the Cypriot economy from 1950 to 1966.

This figures reveal, therefore, that despite an absolute decline in the number of workers employed in large-scale copper mining, increases in wages of the remaining workers as a reflection of the increasing and lately decreasing productivity of the industry have more than compensated for the fall in numbers so that income has flowed into the Cypriot economy in an increasing stream as payments to domestic factors of production.

D. Taxes and Government Participation in Value Added of Cypriot Copper: 1950 - 1966.

(1) In an overall analysis of the participation of an export economy in its major industry, taxation deserves a special place. That is because the decision of the

government to assess earnings of this industry is an arbitary one reflecting no input other than its permission for owners of the industry to conduct business on domestic soil. The very arbitrariness of taxation gives it potential flexibility, and thereby provides local policy makers and economic development planners with a logical tool which may be manipulated at will.

The case of Cypriot copper over the past seventeen years has been a model of constancy: only one main device of taxation has been employed, namely constant income taxation. Other devices such as progressive or regressives taxes, differential exchange rates and export duties, import duties and property taxes were ignored. In this section direct copper taxes will be examined to determine the changing share of the government in returned value of the export industry. Then the tax receipts from the copper industry will be related to total government expenditures to determine the importance of this item in the government budget. After this, the importance of copper earnings as a share of total foreign exchange earnings will be made, to evaluate the role of the export industry in the capacity to import of Cyprus. An attempt

will finally be made to show how the tax component of returned value may be less stable than other components over time.

(2) Total Direct Taxes: 1950 - 1966. The increase in the government's participation in the export industry has been very impressive up till 1957, since then, however it has been declining quite remarkably. From an annual direct taxation of £ 933,048 total taxes soared upward to £3,707,661 in 1957, an increase of 297%, an fell back to £ 1,065,359, a decline of 71%. These figures indicate that the Cypriot government has participated to a large extent in 1950-1957 in the increasing productivity of its major industry, and that this participation has grown at a greater rate than productivity increases; since then, however, this participation has fallen at a more rapid rate than productivity.

Direct taxes being a fixed proportion of income (42.5%) it is interesting to note the decline in the profitability of copper operations in Cyprus: between 1957 and 1966 total sales increased by approximately 50% while total taxes paid decreased by 71%. This may be due to the higher operating expenses incurred in the exploitation

of poorer ore deposits as well as higher depreciation charges consequent to the important exploration and development plans launched in the last 3 years.

(3) Total Taxes as Share of Returned Value: 1950 - 1966. A nation attempting to increase its participation in the total value of production of a foreign owned export industry, may do so through the free market if it has domestic factors of production which can be substituted for foreign ones at competitive prices. For example, if the domestic wage level for all skills is below comparable wages levels abroad, so that the opportunity cost of substituting foreign employees for domestic workers would be negative, an approach to freer competition in the factor market would contribute to a redirection of the flow of income generated in the export sector back into the domestic economy.

Similarly if the domestic capital market exhibited lower interest rates than those abroad, so that the export industry could take advantage of a lower marginal cost of investible funds by utilizing domestic rather than foreign savings, this also would cause a redirection

of the flow of earnings into the domestic economy, by adding interest payments as a component of returned value. One other element to be considered is the ability of the domestic economy to charge rent for the use of mineral resources and to adjust the level of royalty to the point where the marginal efficiency of investment in the export industry approximates yields on similar types of investment abroad (discounting for the element of risk).

The effect of the first two policies, improving the competitiveness of the factor markets for labor and capital, would have an expansionary effect on the export industry to the extent that price elasticity of demand for its product was positive and domestic factors of production of equal productivity were less expensive. The short run effect of the increase in rent would be to raise fixed costs without affecting output, so that the increase in returned value received through additional rental income, would not be offset by decreases in payments to domestic factors of production until the time came for replacement of assets or new investment in the industry.

Another alternative (in cases where domestic factors cannot compete with foreign capital or labor) would be to introduce taxation as a method of extracting a share of the return to foreign capital, since the taxation of other foreign inputs (duties on import of producers foods, taxation of the income by foreign personnel, etc.) would have a short run effect on the conditions of supply of the industry. An export duty would have an effect on the price received by the export industry for its product , tending to shift its demand curve down and thereby restrict output whenever there is any elasticity in the factor markets.

In the case of Cypriot copper none of the above methods has been utilized. The reasons behind this is the absence of serious competitiveness in the factor market for labor and both the relative scarcity of capital and the unwillingness of domestic entrepreneurs to invest in this field. As to the government, it has been unwilling to interfere in the form of input taxation or export duties in order not to discourage new investment in a depleting industry.

From a static point of view, the optimal form of taxation would be direct, taxing profits and thereby causing no adverse effects on the volume of production. Nevertheless the long-run effect of profit taxes is to reduce the marginal efficiency of investment and discourage the replacement of existing plant and equipment or investment in new facilities to the extent that the marginal efficiency of investment in the export industry falls below the marginal cost of investible funds. Also direct taxation has an unstabling effect on government receipts from the export industry, accentuating the impact of the trade cycle on the domestic economy through government expenditures tied to these taxes.

Viewing total taxes from 1950 to 1966, it is apparent that the government has increased both its share in returned value and the share of returned value in total value of production up till 1957. Since then both have been declining. Total taxes represented in 1950 36.60% of returned value, in 1957 --67.42% and in 1966--16.26%.

As taxes have increased the government's share of returned value, they have also increased the

share of returned value in total value of production by taxing a growing share of the payments to foreign capital in 1950 - 1957 and the opposite in 1957-1966. The share of returned value in total value of production in Period I was 91.9%, falling to 85.5% during Period II.

(4) Copper Taxes and Government Expenditures: 1950 - 1966. Since government receipts from the copper industry were a vital source of revenue an attempt is made here (using admittedly crude estimates) to determine the extent to which copper revenues have figured in government expenditures. A comparison of total government receipts from the copper industry with total government expenditure reveals that the proportion has changed noticeably from year to year as well as showing a substantial increase from 1950 to 1957 and an even more substantial decrease from 1957 up till 1966. The average annual percentage of copper taxes in total government expenditures was 22.15% in Period I and 9.55% in Period II.

The decreased role of copper as a source of revenue indicates, that (1) profitability has decreased

for copper mining operations (2) taxation in the rest of the economy has grown at a greater face than taxation in the copper industry (3) the fluctuation in receipts from the copper industry will cause lesser fluctuationi in government receipts and therefore tend to stabilize government expenditures (4) unless new discoveries of ore take place, the government will have to look for other sources of revenue (5) productive capital formation originating from the government sector will be less and less related to earnings of the copper industry.

(5) Returned Value of Copper and the Capacity to Import. The returned value of the copper industry R represent the major part of foreign exchange available to the Cypriot economy for imports. Here is a resource available for the stimulation of productive capital formation distinct from tax revenues, although tax revenues are a component of R. Here again the export industry has provided the Cypriot economy with a regular increase in the capacity to import up till 1958-59, then R started declining with exceptional spurs in certain years. Here again there have been extremely wide fluctuations in the level of R from year to year. For example,

returned value rose from £ 4,327,414 in 1955 to £ 7,381,356 in 1956, or more recently a rise from £ 4,995,886 in 1965 to £ 6,550,789 in 1966.

The reason for inclusion of capacity to import figures in this section on government participation in returned value are two-fold: first in periods of full capacity (particularly in bottle-neck sectors) growth in the economy may only be possible through imports of producers goods; second, general economic growth may be hampered by the import leakage to the extent that foreign exchange earned by the export industry is not used for the purchase of imports which will directly or indirectly permit the expansion of productive capacity of the system. In both of these cases government policy may be essential to the optional use of foreign exchange resources provided by the export industry. In this section the amount of capacity to import generated by the export industry is revealed; since despite the fall in R, returned value is still important in absolute figures, the responsibility of the government sector for optimal use of foreign exchange resources has not yet decreased.

(6) Tax Receipts and Economic Stability. One of the implications of direct taxes comprising a decreasing proportion of returned value is the reduced instability this lends to the economy. To the extent that returns one capital are wholly exported abroad, this cyclically unstable component of total value of production (being the first to reflect the shock of fluctuations in demand) will be insulated from the income stream of the domestic economy. However as the government through direct taxation participates in earnings of capital, the unstable nature of the earnings will be passed on through returned value into the the domestic income stream. Therefore, as the share of taxation in total returned value decreases, one would expect the instability of returned value to decrease.

That the opposite has happened can be explained by the unstable political situation in the country and by the even more unstable investment policy followed by the copper companies. If we compare the average percentage change from year to year in returned value (R) in the period 1950 - 1959 with the period 1960-1966, we see that the figure has climbed from 17.7% to 39.6%. The

fluctuations is returned value are of interest because of their effect in the stability of the economy and also because of the direction of change relative to changes in GDP. It would be interesting to compare the value of copper taxes and Gross Domestic Product of Cyprus for the years 1950 to 1966. These figures reveal that in only five of the seventeen years did tax receipts from copper change in the opposite direction from changes in the level of Gross Product. Furthermore, in only one of these five years (1960) did tax receipts increase as Gross Product declined, tending thereby to stabilize the system. It is not difficult to conclude from this evidence that the contention by Wallich that export industries increase rather than decrease the cyclical problems of their economies is justified to a certain extent in the case of Cyprus. That is because increases in government expenditures to stimulate income during periods of unemployment will be non-inflationary only if there is substantial excess capacity in the system (without significant bottle-necks) or if tax receipts are sufficient to offset the increased spending. However, tax receipts from the export industry have in all cases but one declined as Gross Product declined, reducing the resources of the

government which may be applied to compensitory fiscal policy. In addition to this, the export economy is likely to require a sustained amount of essential inputs from abroad despite cyclical fluctuations in foreign exchange earnings, so that a destabilizing fall in the tax component of returned value will provide less funds for essential inputs during periods when the government may most desire to stimulate capital formation through imports of producers goods. It should be noted that in recent years the increased volatility of the tax component of returned value has been compensated in its impact on government revenue by the decreased importance of its absolute magnitude.

E. Copper Export as a Determinant of Economic Growth in Cyprus: 1950 - 1966.

(1) Copper Investment and Copper Sales. The most direct effect of copper exports on Cyprus' economic growth would occur through a relationship between exports and investment in the export industry. Therefore we shall test the statistics from 1962 to 1966 to determine whether there is a relationship between the change in value of

sales in the preceding period and the change in the amount of investment expenditures in the present period.

If a relationship can be established between this set of variables, then the export industry will fulfill one of the conditions in which it may be a determinant of economic growth of the domestic economy. This is because an increase in exports, if they generate new capital formation in the export industry which will produce a further increase in the value of exports, will then have a positive effect on the level of income in the system through the channeling of increased total value of production into returned value. This will bring us to the second part of this section, which relates returned value to total value of production.

Let us then attempt to determine whether or not a relationship exists between the change in the amount of investment in the export industry and the change in the value of sales of the industry (a relationship analogous to but not the same as the accelerator and pertaining only to the export industry). For this purpose a correlation was computed between $\overline{DC}$ and $\overline{DpQ}$ for the period from 1962 to 1966. Here the precise relationship to be

measured is the correlation between $\bar{C}pt-\bar{C}pt-1$ (the first order difference in value of total capital formation of copper mining) and $\overline{pQ}t-1 - \overline{pQ}t-2$ (the second order difference between value of sales in the past period and value of sales in the second preceding period). It is assumed in attempting to determine whether such a relationship exists that there may conceivably be a causal connection between the changing level of sales (with a one period lag) and the changing level of investment. Nevertheless, the coefficient of correlation proved to be extremely low (.0164) indicating that there may be a relationship between the changing level of sales for the preceding period and the change in the present level of investment for the copper industry, but that such a relationship is almost totally insignificant.

Even if an estimator of the determining variables of total capital formation in the export industry ($\overline{Cp}$) were provided, one would still have to measure the impact on the Cypriot economy of total capital formation through employment of domestic factors of production on capital account. Therefore we shall attempt to estimate the relationship between domestic capital formation and total capital formation for the copper industry

(i.e. relationship between Cp and $\bar{C}p$). A test for such a relationship on the basis of our data is extremely difficult for earlier years, since the proportion of domestic capital formation to total capital formation was not published. Nevertheless for the period from 1962 to 1966 the proportion is examined in Table III-E-1.

TABLE III-E-1

DOMESTIC INVESTMENT EXPENDITURE & TOTAL INVESTMENT EXPENDITURES OF COMPANY "A" FOR THE YEARS 1962-1966

Year	Value of Total Investment Expenditure ($\bar{C}p$) (1)	Value of Domestic Investment Expenditure (Cp) (2)	Col (2)-(1)=(3) (3)
1966	₺ 1,585,855	1,104,357	69.64%
1965	1,115,646	800,422	71.74
1964	704,753	450,113	63.87
1963	1,111,167	551,000	49.58
1962	1,065,364	554,200	52.02

Source: Report of the Senior Mines Officer 1966, 1965, 1964, 1963, and 1962.

These figures reveal a rather unstable relationship between domestic investment expenditure and total investment expenditure for the five years examined. Column (3) reveals

that the proportion has fluctuated from 49% in 1963 to 71% in 1965. Therefore a prediction of the value of domestic capital formation generated directly by total investment in the export industry would be extremely unreliable, since the share of total local capital formation including wages, salaries, purchases of machinery and equipment and raw materials (if any), and services may vary as widely as 22 percentage points. Moreover the type of facility being constructed would have a very important effect on this proportion, to the extent that construction of plant facilities and worker housing would have a higher labor input, while supplying of plant with machinery and equipment would presumably have a higher import content.

One conclusion which may be drawn from the statistics is that lumpiness of capital inputs is certainly present in the copper industry. This is true not only because there are a small number of firms in the industry so that each firm's investment has a large effect on the total, but also because the firm themselves tend to invest sporadically. A mine cannot be relocated gradually, and although ball mills may be added one by one to a crusher plant, a new electrical power generating plant must be

constructed as a unit. Therefore whatever stimulus to economic growth in the rest of the economy such domestic capital expenditures in the export industry are likely to have, they will not be continuous and they will not be at a constant level.

(2) Returned Value as a Share of Total Value of Production. Aside from the immediate impact of investment within the export industry on the growth of the Cypriot economy, which may be affected indirectly if not directly by the amount of copper sales, the value of sales has another impact on the system through the share of returned value which is channeled into the income stream. If copper exports are to generate economic growth through their effect on income and purchasing power of the export economy, this will defend upon the returned value component R. Therefore, total value of production (V) is the significant determining variable, with returned value R being the dependent variable in this relationship.

To test this relationship a regression of R on V has been performed with the following results:

$R_t = 1,866,800 + 0.52675\ V_t$.

The relationship revealed by this regression shows that R for very high values of V will represent approximately 53% of the total value of production. A test for the significance of the coefficient revealing the share of R in V shows that this significance is not high. For a 95% confidence interval, the value of the estimator falls between .31115 and .74235. With this variation in the estimator it is apparent that very little predicting could be done with this simple model. The intercept coefficient 1,866,800 indicates that the share of returned value in total value of production is decreasing progressively as V increases, a fact revealed by a casual look at the statistics. The model does not reveal any more significant answers than earlier observations of the data have indicated. One of the explanations for this may be the small number of companies, the rapid changes in the rates of profits, wage levels, and other factors determining the level of R.

With returned value such an erratic function of total value of production, the unstability of the system is heightened by fluctuations in total value of

production caused by changes in price and quantity produced. Moreover a systematic estimation of the relationship between changes in GNP and changes in total value of production is rendered extremely hazardous by such unstable functional relationships between V and R.

(3) The Rate of Growth of Gross Product in the Cypriot Economy and Returned Value. To examine whether changes in returned value have had any observable effect on economic growth of Cyprus, let us look at the results in Table III-E-2.

This table reveals a relationship between the changes in returned value and changes in Gross Product of Cyprus for the period selected. For example, during the years of most rapid increase in returned value (1956 and 1965) the most rapid annual increase in Gross Product was seen (13% and 19% respectively). Similarly in the years of decrease in returned value, a decrease was generally observed in Gross Product.

TABLE III-E-2

ANNUAL PERCENTAGE CHANGE IN RETURNED VALUE AND GROSS DOMESTIC PRODUCT

Years	Annual % change in returned value of copper (R) (1)	Annual % change in Gross Product of Cyprus (GDP) (2)
1951	37%	1%
1952	5	11
1953	...*	9
1954	...*	1
1955	- 4	2
1956	70	13
1957	-34	7
1958	6	- 5
1959	- 2	- 1
1960	-19	- 4
1961	n.a.	9
1962	n.a.	7
1963	n.a.	6
1964	-44	- 10
1965	65	19
1966	31	7

Sources: Column (1) is taken from Appendix Column (8) and Column (2) from Appendix Column (23).

*Less than 1%.

(4) Dualism and the copper industry. It was suggested in Chapter I that having accepted the concept "returned value" two possible measures of dualism in the export industry are available. The first is the share of returned value in total value of production ($R \div V$) and its behavior over time. The second measure is the share of domestic investment expenditures of the export industry in the total investment expenditures in the industry ($Cp \div \bar{C}p$).

If these measures are accepted as a partial estimate of the extent of dualism in the export industry and its relative change over time, it can be noticed that dualism in the Cypriot copper industry has no diminished between 1950 and 1966 and may have even increased. Column (13) in the Appendix reveals that the average proportion of returned value in total value of production up till 1959 was 94.14%; this figure fell to 78.20% during 1960-1966 indicating an increase in the amount of dualism perhaps reflecting a minimum of townsite construction expenditure which generally has a high proportion of local expenditure to total cost and the desire of foreign companies to repatriate more of earnings in view of the depletion of the industry.

The second measure of dualism, represented by the share of domestic expenditure in total capital formation of the export industry, is revealed in Table III-E-1. Here, the number of observations is so small and the proportion of domestic expenditures to total investment expenditures has fluctuated so widely that any meaningful statement of increasing dualism is impossible from the data. It would appear, however, that between 1962 and 1966 the increase in average proportion of domestic expenditures to total expenditures from 52% to 69% is indicative of a trend toward more purchases of capital goods locally. This would be expected to occur in any developing economy as the industrial base of the society expands so that more producers goods as well as consumer goods are produced domestically. As the quality and price of these goods become competitive with those sold abroad there will be a gradual trend toward more purchases of necessary inputs from the local market.

(5) Returned value as a potential determinant of growth. Chapter I stressed the importance of the exports as a determinant of income in the export economy. It is suggested in this study that the concept "returned value"

is preferable to "total value of exports" in such an analysis. Returned value and not total value of exports is the exogenous factor operating as a determinant of the level and potential rate of growth of the export economy. If we compare the magnitude of returned value with the magnitude of other variables in the system such as government spending, we see that the importance of returned value of the copper industry has decreased tremendously in the past ten years, and that therefore the chances of the copper industry being a determinant of growth are much less now than they were in 1950-1957. However the Cypriot economy cannot afford to ignore the returned value from its export industry. To the extent that this possible stimulus is lost, to that extent the services of its factors of production are lost forever.

(6) The copper industry as a "leading sector." The previous section reveals that the export industry has provided a potential determinant of growth which could have been designed to act somewhat as a "leading sector" in terms of the Rostow analysis mentioned in Chapter I. That this has not been the case for the Cypriot economy is revealed by the slow cumulative rate of growth in gross

product between 1950 and 1957 of 4.8% per year, causing a negligible increase in per capita output for the period.

No recent observer of the Cypriot economy would maintain that a take-off has taken place, so one may conclude that returned value of the copper industry has not been sufficient either in quantity or direction to provide a take-off of the type mentioned in the stages analysis cited earlier in this study. Moreover the statistics reveal that dualism has slightly increased between the copper industry and the rest of the economy, government participation has decreased, only more producers goods are being purchased locally.

One of the reasons for the lack of sustained economic growth in Cyprus may be the absence of forward or backward linkages associated with the production of copper in remote geographical areas using advanced technology for which the machinery and equipment is produced under international patents by a small number of manufacturers in major industrial countries.

A look at the input-output table drawn by Vassiliou[5] for the Cypriot economy in 1957 shows that the

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[5]Meyer and Vassiliou, op. cit.

metal mining sector (of which copper mining is the major component) purchased from the rest of economy the following: $25,000 construction services, $118,000 fuels and lubricants, $121,000 chemicals, $604,000 transportation, and $97,000 various services, a total of $965,000 as compared to $13,899,000 of value added for the same sector.

The question remains, could the copper industry of Cyprus have been a leading sector had other circumstances in the domestic economy been different during the past seventeen years? It is apparent from the foregoing material that neither through producers goods inputs purchased domestically nor through labor inputs hired domestically would the effect of returned value on the Cypriot economy have been sufficient in itself to provide a cumulative sustained rapid rise in total and per capita output.

The material presented in this chapter has been assembled in order to demonstrate quantitatively some of the structural relationships which have existed in Cyprus between the export industry and the rest of the economy over the past seventeen years. While no attempt has been made to formulate a model which will explain the behaviour of the Cypriot economy, much less the behaviour of the

export industry, it is hoped that some light will be shet on the actual impact which the export industry has had on the system and the potential effect which it might have had, had some of the structural relationships been altered. Some of the conclusions and policy implications arising from the foregoing material will be presented in Chapter IV.

CHAPTER IV

IMPLICATIONS OF THE CYPRIOT CASE FOR THEORY AND POLICY

A. Theoratical Implications.

It is the purpose of this chapter to gather together some of the conclusions shown from this analysis of the single export economy which may shed light upon general theoratical problems and suggest specific policy recommendations for economic planners, governments, industry, and labor unions in such countries. The subject of analysis of this paper has been the copper industry in the Cypriot economy between 1950 and the present. The method of analysis has been to isolate the share of total value of copper production which is retained in the domestic economy. This share is termed "returned value" and is employed in a number of ways to analyze such problems as dualism, impact of the export industry on relative shares, secular behaviour of the

terms of trade, and the role of the export industry as a "leading sector" in the export economy.

In the analysis of dualism the share of returned value of total value of production in the export industry provides a convenient measure of the relative return to domestic factors of production. This permits a measure of the extent of dualism within the export industry; it gives no hint as to how the returned value may be channeled into productive capital formation or effective demand which combine jointly to stimulate economic growth, however, it provides a frame of reference from which components of returned value may be analyzed in terms of their specific impact upon the system. Once the extent of dualism is determined, its nature assumes importance. Here it is the composition of returned value which provides us with clues to the monetary impact of the export industry upon the system. A second measure of dualism is provided by the proportion of domestic expenditures in capital formation of the export industry. Once again, the higher the ratio, the greater the relative participation of the industry in the domestic economy.

In the Cypriot case each each of these measures, and particularly the former, indicates that the extent of

dualism in the Cypriot copper industry has shown a marked increase over the past seventeen years. A break down of returned value into its components provides an explanation for this occurence. The government share of returned value in the form of taxation has registered a notable secular decline despite recent increases in total value of production and an increasing share of profit has been repatriated due to the depletion of the industry. While the remotness of the export industry from population centers tend to sustain dualism, a growing share of producers goods has been acquired in Cyprus; moreover, a higher proportion of production and staff workers has been acquired within Cyprus owing to the greater availability of skilled workers and managerial talent domestically, thus providing an important channel for the redistribution of value added of the export industry into channels of productive capital formation.

It is apparent from this study that periods of prosperity for the export industry have also been periods of relative prosperity for the Cypriot economy; however it has been impossible to affirm any causal relationship between returned value of the export industry and general economic growth from the statistics.

The impact of the industry on relative shares is quite observable if one views components of returned value over time. While wages have shown a strong secular increase in the Cypriot copper industry, they comprise a declining proportion of returned value between 1950 and the present owing to the introduction of labor-saving machinery and equipment and more efficient methods of production. While growing productivity of labor has undoubtedly contributed to the rapid and impressive rise in wages in Cypriot copper, it may also be the effect of such increases in labor costs as companies seek to reduce the vulnerability of the industry to collective bargaining. A situation analogous to bilateral monopoly exists in the factor markets of copper mining, where production centers are remote from population centers and where labor unions exist with the authorization of the government as an effective restriction on the supply of labor to the companies. Moreover, the companies which enjoy productivity far in excess of the rest of any Cypriot industry, and which pay considerably higher wages are in a monopsomestic position as they confront the unions. This creates an awkward situation in the factor market which produces extreme instability and uncertainty in the production process as strikes are liable to curtail production at any moment and

cut off the flow of income still relatively important to the economy.

The exact share of total value of production accruing to equity is impossible to ascertain in this paper since particular emphasis is placed upon "returned value," and payments to ownership represent payments to foreign factors of production. Two out of the three major Cypriot copper companies which constitute large scale copper mining are owned by foreign interests. Profits vary greatly among the three companies, with two of the three showing substantial profits in good years while the domestically owned company has operated on the margin during most of the past fifteen years.

The contribution of the export industry to the capacity to import of the export economy has been subjected to long and contentious discussion. It is suggested in this paper that the argument pertaining to secular improvement or decline in the terms of trade of raw materials or primary product producing countries be viewed in the light of a new measure of the terms of trade which utilizes the returned value per unit of production of exports as the numerator and the unit of value of imports as the denominator.

This measure is called the "returned value terms of trade" and reveals some very interesting relationships in the Cypriot case. While a secular improvement in the barter terms of trade occurred in the case of Cyprus' copper exports, an even better improvement in the returned value terms of trade took place simultaneously. This was accounted for by the rise in the price of copper and by a much lower proportional increase in the price of imports.

It is suggested here that even though a secular decline in price may take place for the raw material or primary product of the developing country, an improvement in the (more significant) returned value terms of trade may offset this decline as the country's share of returned value in total value of production increases. This will be particularly true as dualism is reduced by growing contribution of the industry in the domestic economy either directly through greater use of local inputs or indirectly through a growing participation of the government in the value of production through taxation, export duties, differential rates of exchange and the like.

The fluctuations in terms of trade which is also a cause of instability in the export economy may also be more meaningfully analyzed in terms of the returned value terms

of trade. In the Cypriot case such an analysis reveals that the returned value terms of trade are more stable than the copper terms of trade owing to the profit component in the later.

In an analysis of economic growth of the export economy, the export industry may be viewed as a potential leading sector. This may be the case if the absolute magnitude of net returned value and/or domestic investment expenditures is sufficiently large relative to gross product and adequately linked to the rest of the economy to provide a major stimulus for growth in other sectors leading ultimately to a sustained increase in gross product. Here again the use of the concept "returned value" is helpful in relating this general concept to the specific role of a single export industry at a given time and place. In the Cypriot case the income from copper exports represented a continually declining proportion of government spending reaching 5,35% in 1966. That the Cypriot copper industry might have been a leading sector is conceivable only had the component of returned value representing government revenue been used more productively for domestic capital formation rather than to defray government operating expenditures. Such was not the case, however; meanwhile the

other components of returned value did not provide stimuli for the rest of the Cypriot economy adequate to produce a "take-off" or sustained economic growth. Reinvestment of profits earned in the production of copper, by foreign owners, were devoted primarily in the expansion of existing copper producing facilities or the opening of new mines.

This analysis has revealed that where profits from an export industry are not reinvested in other sectors of the domestic economy, and where domestic recipients of factor payments from the export industry do not demonstrate a high marginal propensity to save or invest, the government as a participant in returned value must be responsible for stimuli to productive capital formation and the channeling of income produced in the export industry into other sectors which will produce sustained economic growth. The evidence presented in this paper suggests first of all a low trade multiplier in Cyprus, if one relates growth of gross product to growth of the major export industry and second a low propensity of the government as well as the private sector to invest productively their share of returned value of the export sector as an explanation of the former. Moreover, there seems to be a much higher

propensity of foreign capital to reinvest in the export industry than in other sector of the Cypriot economy. It is suggested here that a specification must be brought to the concept of "leading sector" and "take off" to take into account the potentially significant role to be played by the government sector in the utilization of the export industry as a determinant of sustained economic growth.

B. Policy Implications.

Some suggestions for economic policy designed to optimally utilize the export industry as a determinant of economic growth arise from this study. They relate to investment criteria, determination of relative shares, capacity to tax, anti-cyclical policy, and government expenditure policy. While these implications will only be hinted at in this paper, it is hoped that further work will be stimulated by the discussion here.

The choice of investment criteria to be applied to the selection of an optimal industrial configuration for economic growth becomes particularly important for the export industry. This study suggest that the best estimate of potential yield may be achieved by the use of expected

returned value (payments to domestic factors of production and to government) per unit of domestic capital expenditure (measured by opportunity cost). The study reveals that an industry showing a high yield in terms of returned value per unit of capital expenditure would certainly be preferable to those showing a low domestic yield but high total-productivity (a large share of value of production accruing to foreign factors of production) as far as local economic growth is concerned. Furthermore, a foreign owned industry paying a large share of total value of production in taxes to the government may be superior to a locally owned industry with a high returned value component of total value of production representing profits, if the local owners expatriate these profits or demonstrate a low marginal propensity to invest their earnings productively.

Local participation in the export industry may be both private and public. Private participation occurs through payments by the export industry for domestic factors of production. Here the government might exercise a role in the reduction of dualism (increasing the share of returned value in total value of production and increasing the share of domestic capital expenditures in total investment) in several ways. Efforts may be made to

improve productivity of labor through investment in education, housing, and health facilities. The government may assist the workers to benefit from productivity increases through higher wages by encouraging the national formation of labor unions designed to increase the relative share of labor without permitting wage increases to exceed productivity increases. The Cypriot experience provides a case where collective bargaining and resulting increases in real wages appear to have accompanied and perhaps fostered investments in plant and equipment of a labor-saving variety. While this has permitted increased productivity of workers in the industry and further increases in wages, it has also resulted in a declining share of labor force employed by the export industry. Furthermore the share of wage costs in total returned value has diminished over time so that this industry is losing its relative importance as an employer of Cypriot labor.

The government may also improve the relative share of domestic factors of production in the export industry by improving the quality and lowering the prices of locally manufactured producers goods. This may be done by fostering greater competition in the producers goods industries, by permitting tax allowances for investment in improved

machinery and equipment in these industries, through encouragement of the rationalization of business enterprise, and through the improvement of internal transportation and other social overhead facilities.

Public participation in the export industry may take place through government taxation of export earnings. This will only be possible if excess profits arise in the industry, and if the industry is located in the domestic economy for the purpose of exploiting scarce factors of production (for example mining). The government may pursue two goals here, the short-run objective of maximizing returned value per unit of total value of production, and the long-run objective of enabling the maximization of total inputs in returned value. In the former case taxation may increase up to the point where the opportunity cost of investing in the export industry exceeds the net yield after taxes. In the latter case the point where taxation becomes an active deterrent to future investment in the export industry may be extremely difficult to predict, depending upon the elasticity of expectation of future tax increases within the economy and abroad, the external economies derived from ownership of the export industry, and other factors. In the Cypriot case it appears that the current

rates of taxation, have not been sufficient to halt investment in all three of the companies.

Both private and public participation in the export industry, while extremely beneficial to the domestic economy, increase vulnerability of the economy to the international trade cycle. Government policy should therefore be designed to reduce the fluctuations in returned value of the export industry or the effect of these fluctuations on the rest of the economy. Measures suggested by this study include the promotion of capital formation in the export industry during periods of decline in export earnings. In this manner domestic investment expenditures of the export industry would offset declines in factor payments for operations. It is contended that this policy is feasible in the Cypriot copper industry since capital requirements may be anticipated by the companies well in advance of actual need for such investment.

Another factor serving to reduce the vulnerability of the domestic economy to the international trade cycle would be to increase the share of the private economy in returned value of production. That is because the government's share of returned value is predominantly direct taxation, which is a function of profits which are the

components of total value of copper production most vulnerable to fluctuations in price and quantity. While this would appear to be inconsistent with the earlier suggestion for increasing the share of returned value in total value of production, this is not necessarily the case. It is argued in this paper that taxation as a device to increase the ratio should be used only as a last resort after other methods of improving the relative share of domestic factors of production have been exhausted.

It is also suggested that the economy would be less subject to fluctuations in export earnings if government expenditure were directly related to income and designed to produce a surplus of foreign exchange in boom years and deficit in recession years through the accumulation of stocks of foreign exchange derived from the export industry. This policy calls for separate accounting of revenues derived from the export industry and expenditures arising from such revenues. Such is not the case in Cyprus at the present time, since copper revenues go directly into the administrative budget and are not earmarked for specific expenditures.

As concomitant to the separate accounting of revenues from the export industry and their corresponding expenditures, it is suggested here that the government might divide revenues derived from the industry into stable and unstable components. The stable component would be that quantity of foreign exchange which may be expected with a high degree of certainty though all phases of the international trade cycle, and the unstable component would represent short-run gains in earnings which may not be expected to persist over time. The stable component of revenue would then be used for long-run expenditures such as investment in industries with long periods of gestation, social overhead facilities, administration of government development programs, and the like. The short-run component of export-industry revenues would be used explicitly for expenditures which may be terminated at the end of a twelve month period, such as fellowships for the training of technicians, engineers, and managers, construction of feeder roads, building of schools and hospitals, etc.

Economic development policy of the government in the export economy should be explicitly designed to utilize revenues derived from the export industry in the most productive sectors, particularly in instances where

the nature of the export industry and its geographical location produce aspects of dualism which cannot be expected to diminish automatically over time, and where the marginal propensity to invest of domestic factors of production is low, the ability of the government to tax the export industry and to use tax revenues for productive capital formation may be crucial to economic growth. This is particularly true in the case of the Cypriot copper industry; here the unimpressive evidence of an explicit foreign trade multiplier for the Cypriot copper industry indicates that components of returned value including government taxation have not been used as productively as they might have been to stimulate further investment in other sectors of the economy.

C. Conclusions.

In the analysis of economic growth of the developing countries, the export economy has a special place. Here it is possible to isolate one industry which has a potentially great influence on the economic growth of the rest of the economy. This analysis suggests that in such economies the export sector should be treated

separately and analyzed in detail using the concept of returned value to determine the nature and extent of the export industry's participation in the rest of the economy.

Where difficulties arise from a highly productive but highly unstable export sector, it is suggested that these difficulties not be avoided by deemphasis of the sector, but be met by sophisticated economic policy. The Cypriot experience reveals that an export industry may provide a source of productivity far in excess of any other sector of the economy. It also reveals that this productivity may be channeled into returned value through increased payments to labor, greater domestic expenditures for goods and services, and through government revenue.

The disadvantages of dependence upon the export industry can be offset by policy designed to maximize the share of returned value of production in total value of production in the short-run, and the absolute level of returned value in the long-run.

Where natural problems of dualism arise with an export industry, for geographical or technological reasons, government participation in returned value through taxation

and effective expenditure policy may do much to offset this dualism and utilize the export industry as a primary determinant of economic growth.

Once the decision is made to single out the export industry as a significant component of economic change, concepts of returned value provide many opportunities to quantify explicit relationships between this industry and the rest of the economy. Such quantification reveals interesting information about the nature and extent of dualism in the export industry, the foreign trade multiplier derived from the industry, the impact on relative shares of the industry, the secular behaviour of terms of trade for the industry, and the role of the industry as a leading sector in economic change.

It is hoped that this analysis of the Cypriot experience will provide a stimulus for further investigation of the structural and developmental problems of export economies and yield insights into the general problems of economic growth of the developing countries.

Statistical Appendix

Year	(1) Total sales of Co. A,B,C. £	(2) Direct taxation according to year of Income Taxed Co. A,B,C. £	(3) Total yearly labor cost £	(4) Total production of Copper Tons	(5) Cypriot mills per Ton of Copper Sold *
1950	2,837,300	1,153,891	933,048	23,000#	123.36
51	5,067,500	1,357,345	1,120,356	22,000#	230.34
52	6,536,038	1,493,170	1,281,492	26,000#	251.39
53	3,331,624	1,750,288	1,369,692	21,000#	158.65
54	5,100,111	1,890,173	1,373,976	27,000#	188.90
55	5,918,889	2,288,782	1,314,156	23,000#	257.34
56	9,160,978	2,869,989	1,791,316	35,000#	261.74
57	6,182,145	3,707,661	1,302,264	38,996	158.53
58	4,970,948	2,551,434	1,284,168	32,691	152.06
59	6,386,712	1,808,068	1,343,052	35,695	178.92
1960	6,212,848	2,256,711	1,327,668	34,907	178.00
61	4,847,694	2,051,808	1,370,736	28,201	171.90
62	4,405,474	1,486,454	1,493,124	24,763	177.91
63	4,520,115	1,210,466	1,333,116	25,893	174.57
64	4,782,091	865,146	864,888	16,530	289.30
65	6,587,130	743,086	1,299,252	18,960	347.42
66	9,099,450	1,065,359	1,470,792	24,347	373.74

* Columns (1) + (4) = (5)

\# Rounded to the nearest thousand.

Statistical Appendix (Cont'd)

Year	(6) Local Investment expenditures, Operating expenses & Miscellaneous charges £	(7) Net Income of Co. B. £	(8) Gross Returned value # £	(9) Total expenditures on all operations by Co. A,B,C. £	(10) Direct taxes as % of R
1950	1,065,777	n.r.*	3,152,716	4,500,000	36.60
51	1,848,881	"	4,326,582	5,600,000	31.37
52	1,762,773	"	4,537,435	5,800,000	32.90
53	1,423,287	"	4,543,267	5,500,000	38.52
54	1,254,363	"	4,518,512	5,400,000	41.83
55	724,476	"	4,327,414	5,800,000	52.89
56	2,720,051	"	7,381,356	9,500,000	38.88
57	489,488	"	5,499,413	7,250,000	67.42
58	2,018,808	"	5,854,410	7,600,000	43.58
59	2,609,015	"	5,760,135	7,450,000	31.39
1960	1,533,074	(278,262)	4,839,191	6,081,442	46.62
61	n.a.	(412,631)	n.a.	n.a.	n.a.
62	n.a.	(142,458)	n.a.	n.a.	n.a.
63	1,966,953	(157,629)	4,352,906	5,773,016	27.81
64	1,356,246	(53,704)	3,032,576	4,805,957	28.52
65	2,830,313	123,235	4,995,886	6,112,869	14.87
66	3,661,304	353,334	6,550,789	8,561,844	16.26

* Not relevant since the Company was foreign owned before 1960.

\# Columns (2) + (3) + (6) + (7) = (8).

Statistical Appendix (Cont'd)

Year	(11) Estimated total labor cost as % of R	(12) (6) as % of R	(13) Returned value as % of total value of production*	(14) Non-Returned value** (V-R)	(15) Returned value per ton of Copper produced £
1950	29.60	33.80	111.12	(315,416)	137.07
51	25.89	42.74	85.38	740,918	196.66
52	28.24	38.86	69.42	998,603	174.52
53	30.15	31.33	136.37	(1,211,643)	216.35
54	30.41	27.76	88.60	581,599	167.35
55	30.37	16.74	73.11	1,591,475	188.15
56	24.28	36.84	80.57	1,779,622	210.90
57	23.68	8.90	88.96	732,732	141.03
58	21.94	34.48	117.77	(883,462)	179.08
59	23.32	45.29	90.19	626,577	161.37
1960	27.42	31.61	77.89	1,373,657	138.63
61	n.a.	n.a.	n.a.	n.a.	n.a.
62	n.a.	n.a.	n.a.	n.a.	n.a.
63	30.63	45.19	96.30	167,209	168.11
64	28.52	44.72	69.00	1,749,515	183.46
65	26.01	56.65	75.84	1,591,244	263.50
66	22.45	55.89	72.00	2,548,661	269.06

* (1) (8) = (13)

** (1) - (9) = (14)

Statistical Appendix (Cont'd)

Year	(16) R/ton Index	(17) Cyprus export price Index 1946-1950= 100	(18) Cyprus import price Index	(19) Net Barter terms of trade	(20) Cyprus Copper price Index*
1950	100.0	113.4	96.7	117.6	100.0
51	143.5	144.4	117.4	123.0	186.7
52	127.3	162.1	123.2	131.6	203.8
53	157.8	148.7	108.4	137.2	128.6
54	122.1	155.3	103.6	149.9	153.1
55	137.3	166.7	108.7	153.4	208.6
56	153.9	192.3	113.8	169.0	196.3
57	102.9	159.4	119.5	133.4	128.5
58	130.6	151.8	113.6	133.6	123.3
59	117.7	146.3	117.7	124.3	145.0
1960	101.1	144.8	109.1	132.7	144.3
61	n.a.	147.8	106.5	138.8	139.3
62	n.a.	158.8	111.8	142.0	144.2
63	122.6	151.1	109.8	137.6	141.5
64	133.8	149.1	106.2	140.4	234.5
65	192.2	164.3	111.4	147.8	281.6
66	196.3	187.1	109.5	170.9	302.9

* from (5).

Statistical Appendix (Cont'd)

Year	(21) Copper terms of trade**	(22) Returned value terms of trade#	(23) Cyprus GDP at factor cost £ Million Current	(23) Constant 1950=100	(24) Total value of Copper production GDP	(25) Gross Returned value of Copper production GDP
1950	103.4	103.4	38.7	38.7	7.33%	8.14
51	159.0	122.2	46.1	39.0	10.99	9.38
52	165.4	103.3	54.5	43.1	11.99	8.32
53	118.6	145.6	60.0	47.1	5.55	7.57
54	147.8	117.9	63.1	47.5	8.08	7.16
55	191.9	126.3	66.9	48.4	8.85	6.47
56	172.5	135.2	80.8	54.7	11.34	9.13
57	107.5	86.1	84.2	58.8	7.34	6.53
58	108.5	115.0	80.3	55.7	6.19	7.29
59	123.2	100.0	76.6	55.1	8.34	7.52
1960	132.3	92.7	75.0	52.8	8.28	9.16
61	130.8	n.a.	81.8	57.7	5.93	
62	129.0	n.a.	88.4	61.7	4.98	
63	128.9	111.7	94.6	65.6	4.78	6.63
64	220.8	126.0	86.4	59.4	5.53	5.11
65	252.8	172.5	107.2	70.5	6.15	7.09
66	276.6	179.3	115.3	75.5	7.89	8.68

** (20) (18) = (21).

(16) (18) = (22).

Statistical Appendix (Cont'd)

Year	(26) Total value of export of Cyprus £ 000s	(27) Copper sales as % of total exports *	(28) Govt. expenditures £ 000s	(29) Govt. copper revenues as % total Govt expenditure**	(30) Total sales of Co. A,B, C. 1950 prices £
1950	10,487	26.18%	5,215	22.13	2,837,300
51	14,280	35,48%	6,419	21.14	2,713,920
52	16,735	39.06	6,759	22.09	3,207,360
53	14,440	23.07	8,696	20.12	2,590,560
54	16,007	31.86	10,580	17,86	3,330,720
55	17,535	33.75	10,995	20.81	2,837,280
56	20,935	43.76	12,017	23,87	4,317,600
57	17,263	35.81	12,690	29.21	4,810,547
58	16,079	30.91	12,492	20.42	4,032,761
59	16,855	37.89	14,152	12.78	4,403,335
1960	16,735	37.12	17,176	13.13	4,306,127
61	15,780	30.72	18,339	11.18	3,478,875
62	18,218	24.18	18,544	8.01	3,054,763
63	19,429	23.26	18,175	6.66	3,194,160
64	17,940	26.66	18,347	4.71	2,039,140
65	23,139	28.46	19,732	3.77	2,338,905
66	27,170	33.49	19,927	5.35	3,003,445

* (1) (26) = (27).

** (2) (28) = (29), Govt. copper revenues do not include indirect taxes because data is not available.

Statistical Appendix (Cont'd)

Year	(31) Average number of workers employed by Co. A	(32) Average number of workers employed by Co. B	(33) Average number of workers employed by Co. C	(34) Total #	(35) Annual tons of copper produced per employed workers*
1950	n.a.	n.a.	n.a.	3843	5.98
51	"	"	"	4218	5.22
52	"	"	"	4312	6.03
53	"	"	"	4340	4.83
54	"	"	"	4329	6.24
55	"	"	"	4634	4.96
56	"	"	"	4375	8.00
57	1968	1282	348	3598	10.84
58	1967	1178	352	3497	9.35
59	2003	663	467	3133	11.39
1960	1918	879	438	3235	10.79
61	2065	1015	417	3497	8.07
62	2128	880	309	3317	7.47
63	2408	821	416	3645	7.10
64	1788	694	333	2815	7.94
65	1912	884	536	3332	5.69
66	2158	935	398	3491	6.97

(31) + (32) + (33) = (34).

* (4) (34) = (36).

Statistical Appendix (Cont'd)

Year	(36) Productivity Index*	(37) Total labor cost per worker year# £	(38) Total labor cost per ton of copper produced## £
1950	100.00	242.8	40.57
51	87.29	265.6	50.93
52	100.84	297.2	49.29
53	80.77	314.9	65.22
54	104.35	317.4	50.89
55	82.94	283.6	57.14
56	133.80	409.5	51.18
57	181.27	361.9	33.39
58	156.35	367.2	39.28
59	190.47	428.7	37.63
1960	180.43	410.4	38.03
61	135.00	392.0	48.61
62	124.92	450.1	60.30
63	118.73	365.7	51.49
64	132.77	307.2	52.32
65	95.15	389.9	68.53
66	116.56	421.3	60.41

* from (35).

\# (3) (34) = (37).

\#\# (3) (4) = (38).

Source: Department of Statistics and Research. Ministry of Finance and Mines Department - Ministry of Commerce and Industry - Cyprus.

BIBLIOGRAPHY

Public Documents

Government of Cyprus. Cyprus Gazette. Supplement No. 5. March 5, 1951.

Government of Cyprus. Mines and Quarries, chapter 270 of the Laws. 1959 Edition.

International Monetary Fund, International Financial Statistics. Vol. XX, Number 12. December 1967.

United Nations, Department of Economic Affairs. Instability in Export Markets of Under-Developed Countries. E/2047/Rev. 1ST/ECA/15. September 1952.

United Nations, Conseil Economique et Social, Commission Economique pour l'Afrique. Rapport Sommaire sur l'Etude Preliminaire des Possibilites d'Implanter des Industries du Cuivre, du Plomb et du Zinc en Afrique de l'Ouest jusqu'en 1980. March 1967.

United Nations, Economic and Social Council, Commission on International Commodity Trade. Trends in International Trade in Major Minerals. E/CN.13/L.74. April 1963.

Books

Alpert, Paul. Economic Development. London: Collier-Macmillan Ltd., 1963.

Bauer, P.T., and Yamey B.S. The Economies of Under-Developed Countries. Cambridge: Cambridge University Press, 1957.

Bear, L.M. The Mineral Resources and Mining Industry of Cyprus. Cyprus: Ministry of Commerce and Industry, 1963.

Bryce, M.D. Policies and Methods for Industrial Development. New York: McGraw-Hill Book Company, Inc., 1965.

Buchanan, N.S., and Ellis, H.S. Approaches to Economic Development. New York: The Twentieth Century Fund, 1955.

Ellis, H. Economic Development for Latin America. London: Macmillan & Co. Ltd., 1961.

Ehke, Stephen. Economics for Development. Englewood Cliffs: Prentice-Hall, Inc., 1963.

Harris, S.E. International and Interregional Economics. New York: McGraw-Hill Book Company Inc., 1957.

Kindleberger, C.P. Foreign Trade and the National Economy London: Yale University Press, 1963.

Krivine, David. Fiscal and Monetary Problems in Developing States. New York: Frederick A. Praeger, 1967.

Lavender, David. The Story of Cyprus Mines Corporation. San Marino: The Huntington Library, 1962.

Levin, J.V. The Export Economies: Their Pattern of Development in Historical Perspective. Cambridge: Harvard University Press, 1960.

MacBeah, A.I. Export Instability and Economic Development. London: George Allen & Unwin Ltd., 1966.

Meier, Gerald M. International Trade and Development. New York: Harper & Row, 1963.

Meier, G.M., and Baldwin, R.E. Economic Development, Theory, History, Policy. New York: John Wiley & Sons, Inc., 1957.

Meyer, A.J., and Vassiliou Simos. The Economy of Cyprus. Cambridge: Harvard University Press, 1962.

Myint, Hla. The Economics of the Developing Countries. New York: Frederick A. Praeger, 1964.

Nurske, Ragnar. Problems of Capital Formation in Underdeveloped Countries. Oxford: Basil Blackwell, 1960.

Okun, Bernard., and Richardson, R.W. (ed.) Studies in Economic Development. New York: Holt, Rinehart and Winston, 1961.

Pepelasis, Adamiantos., et al. Economic Development. New York: Harper & Brothers, 1961.

Rao, V.K.R.V. Essays in Economic Development. Bombay: Asia Publishing House, 1964.

Robie, E.H. (ed.) Economics of the Mineral Industries. New York: The American Institute of Mining, Metallurgical, and Petroleums Engineers, Inc., 1959.

Rostow, W.W. (ed.) The Economics of Take-off into Sustained Growth. London: Macmillan and Co. Ltd., 1963.

_____., The Process of Economic Growth. Oxford: The Clarendon Press, 1960.

_____., The Stages of Economic Growth. Cambridge: Cambridge University Press, 1960.

Thorp, W.L. Cyprus-Suggestions for a Development Programme. New York: United Nations, 1961.

Wallick, H.C. Monetary Problems of an Export Economy. Cambridge: Harvard University Press, 1960.

Articles and Periodicals

Fleming, Marcus "External Economies and the Doctrine of Balanced Growth," The Economic Journal, LXV (June, 1955), 241.

North, Douglas C. "Location Theory and Regional Economic Growth," Journal of Political Economy, LXIII (June, 1955), 243.

Reynolds, C.W. "Domestic Consequences of Export Instability," American Economic Review, LIII (May, 1963), 93.

Rostow, W.W. "The Take-off into Self Sustained Growth," The Economic Journal, LXVI (March, 1956), 29.

Singer, J. "The Distribution of Gains Between Investing and Borrowing Countries," American Economic Review, LXV (May, 1950), 248.