USER COST OF CAPITAL: A TWO DIGIT SECTORAL ESTIMATION FOR THE LARGE SCALE GREEK MANUFACTURING: 1958-1977

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I INTRODUCTION

The price of capital services that has become common in the relevant literature by the name of user cost of capital, has been employed as an argument in a wide variety of subjects in empirical economics, such as production functions, investment functions, profit functions, price equations etc.

However, due to difficulties regarding the precise measurement of user cost and mainly due to data unavailability many authors facing the estimation of a function containing such a variable have resulted to the use of proxies of dubious validity. As a result the empirical estimates of the parameters of such functions have to be treated with caution.

The paper provides an approach to the measurement of user cost of capital for each two digit Standard Industrial Classification sector of the Greek Industry (SIC 20-39) for the period 1958- 1977, using yearly data that correspond directly with the main bulk of information for large scale manufacturing as this is provided by the Annual Industrial Serveys (AIS) of the National Statistical Service of Greece. Calculations of user cost of capital for two digit industrial sectors for the Greek Industry have previously been published by Manassakis [34] [35]. The difference between Manassakis' [34] estimation of user cost and the estimation presented here is on the coverage of the basis sample used. Manassakis

uses a sample of 297 companies for which a detailed set of information is collected by the Bank of Greece whereas in this study data refer to the large scale manufacturing industry (i.e. all firms employing 10 persons or "more). Although the Bank of Greece sample can be seen to represent adequately the population regarding the whole manufacturing sector, the same does not hold true for the individual two digit SIC sectros[1]. Furthermore in this study the estimation for user cost extends from 1958 to 1977 i.e. it covers the whole period for which there are available sectoral data, and is completely compatible with he set of information given in the AIS [41]. In this respect the methodology of the paper in estimating the various elements entering the user cost formula may be seen as a useful reference for the empirical researcher in the Greek Industry.

Section 2 describes a neoclassical model for the derivation of user cost and an extension of the model to incorporate the effects of tax and other allowances granted to Greek industrial firms. Section 3 is concerned with the analytic derivation of each variable that enters the user cost formula discussing the various assumptions used throughout. Finally in section 4 the data for the user cost for each sector are presented.

II. THE MONDEL

The neoclassical theory of investment behaviour is to a large extent due to the work of P.W. Jorgenson. Ever since his seminal article on capital theory appeared in 1963. [20], there was a series of papers by him and his associates all purporting to explain various aspects of capital theory and investment behaviour. In what follows we will present such a model based on neoclassical assumptions that follows closely Jorgenson's work[2] [15] [21] [22] [23] [24] [25] [26]. Furthermore a tax equation (see below) will be extended to incorporate the effects of capital and other allowances granted to Greek industries in a manner similar to Manassakis [34].

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1. The reason that Manassakis regards his sample as representative with regard to the two digit sectors is that he considers as sectoral population the number of companies for which ICAP [17] provides information. However, while ICAP examines all companies with the legal form of société anonyme and limited liability in this section the population is taken to be the number of companies as given in the AIS, which is significantly larger than that of ICAP since it includes personal companies as well.

2. For a critical evaluation for Jorgenson's work as well as other matters concerning the investment decision of the firm see (43), particularly chapters 7 - 12.

The standard neoclassical formulation of the theory of investment behaviour requires that the demand for capital services (and the demand for other inputs of the firm) is determined in a way that maximizes the net worth of the enterprise. It is assumed (1) that the levels of output and of each variable input as well as of capital services are constrained by a production function and (2) that the rate of change of capital stock is equal to investment less replacement. Replacement is also assumed to be proportional to capital stock. Maximization of net worth implies that a detailed representation of the tax structure facing the company is needed, where all the various charges such as depreciation, cost of capital etc. are included.

Let the difference between revenue and outlay on both the current and capital account in period t and sector i be Z_{it} .Then

$$(1) \quad Z_{it} = P_{it} \cdot X_{it} - S_{it} L_{it} - q_{it} I_{it}$$

where P_{it}, S_{it}, q_{it} the prices of output, variable input and investment in capital stock, respectively

and X_{it}, L_{it}, I_{it} the quantities of output, variable input and investment in capital stock

The representation of tax structure in the neoclassical context should take into account the fact that investors will invest up to the point where the present value of the expected income steam equals cost. That is in absence of tax, invest' ment will carry to the point where gross rate of return equals the cost of borrowing and the stream of depreciation needed to recover capital. The introduction of tax the one hand reduces the expected rate of return but on the other hand the various the tax allowances such as accelerated depreciation, investment allowances, interest rate subsidies etc. reduce the cost. [5] [38].

Let u_{it} be the rate of taxation on net income. Also let v_{it}, W_{it} represent the proportions of depreciation and cost of capital that may be charged against revenue less outlay on the current account in measuring income for tax purposes. If by δ_{it} we represent the rate of depreciation, by r_{it} the cost of capital and by K_{it} the stock of capital, then the amount of direct tax payable by the firm is given by

(2) $$T_{it} = u_{it} \left[P_{it}X_{it} - S_{it}L_{it} - q_{it} \left(v_{it}\delta_{it} + w_{it}r_{it}\right) K_{it}\right]$$

Net worth, V, is defined as the integral of discounted revenue less discounted direct taxes, where r is the rate of discount

(3) $$V = \int_{o}^{\infty} e^{-rt} \left[Z_{it} - T_{it}\right] dt$$

Net worth is maximized subject to the two constraints discussed before. The first is the production function

(4) $$F\left(X_{it}', L_{it}', K_{it}\right) = 0$$

where it should be noted that capital services and not capital stock are an input to the productive process [25]. The second is the assumption about replacement investment

(5) $$K_{lt} = I_{it} - \delta_{it}K_{it}$$

i.e, the rate of change of capital stock is equal to investment less replacement, the latter being proportional to capital stock.

Maximization of net worth (3) subject to constraints (4) and (5) requires the formulation of the usual Langranzian expression

(6) $$R_l = \int_{o}^{\infty} \left[e^{-rt} \left(Z_{it} - T_{it}\right) + \lambda_{0it}F(X_{it}, Lit, K_{it}) + l_{1it} \left(K_{it} - I_{it} + \delta_{it}K_{it}\right)\right]dt$$

The first order conditions for the maximization of (6)

are

$$\frac{\partial R_i}{\partial X_{it}} = e^{-rt}(1-u_{it})P_{it} + l_{oit}\frac{\partial F}{\partial X_{it}} = 0 \quad \textbf{(7.1)}$$

$$\frac{\partial R_i}{\partial L_{it}} = -e^{-rt}(1-u_{it})S_{it} + l_{oit}\frac{\partial F}{\partial X_{it}} = 0 \quad 7.2)$$

$$\frac{\partial R_i}{\partial K_{it}} - \frac{d}{dt}\frac{\partial R_i}{\partial K_{it}} = e^{-rt}u_{it}q_{it}[v_{it}\delta_{it} + w_{it}r_{it}] + l_{oit}\frac{\partial F}{\partial K_{it}} + l_{it}\delta_{it} - \frac{d}{dt}\lambda_{1it} = 0 \quad (7.3)$$

$$\frac{\partial R_i}{\partial l_{oit}} = F(X_{it}', L_{it}', K_{it}) = 0 \quad (7.4)$$

$$\frac{\partial R_i}{\partial l_{iit}} = \dot{K}_{it} - I_{it} + \delta_{it}K_{it} = 0 \quad (7.5)$$

The marginal productivity condition for capital may be written as ;

$$(8) \quad l_{oit}\frac{\partial F}{\partial K_{it}} = e^{-rt}\, q_{it}\, [(1-u_{it}v_{it})\ \delta_{it} + (1-u_{it}w_{it})r_{it}]$$

Combining (7.1) with (8) we can obtain the marginal productivity condition for capital services

$$(9 \quad \frac{\partial X_{it}}{\partial K_{it}} = \frac{\left[\left(\frac{1-u_{it}v_{it}}{1-u_{it}}\right)\delta_{it} + \left(\frac{1-u_{it}w_{it}}{1-u_{it}}\right)r_{it}\right]}{P_{it}}$$

from which the user cost of capital may be defined as

$$C_{it} = q_{it}\left[\left(\frac{1-u_{it}v_{it}}{1-u_{it}}\right)\delta_{it} + \left(\frac{1-u_{it}w_{it}}{1-u_{it}}\right) r_{it}\right]$$

The user cost of capital may be interpreted as the shadow price for capital services stemming from the fact that the firms owns capital stock from which they derive services. It was mentioned in the beginning that the formulation of the tax equation (2) should be adapted to represent adequately the various tax allowances that are available to Greek manufacturing firms. In this respect and following [34] let λ_{it} = the percentage of capital stock that may be charged against revenue less outlay on current account to cover the value of investment, future losses etc. There is a number of legal decrees passed on throughout the period under study from which it is possible to obtain quantifiable information about l_{it}. The total amount of tax deductible from revenue less outlay on the current account is $\lambda_{it} q_{it} K_{it}$

pit = the percentage of investment cost that is granted in the form of tax and duties exemptions since most of capital investment in machinery is imported. In this respect the total amount deductible is equal to $\rho_{it} q_{it} I_{it}$

With these two modifications tax equation (2) may be written as

$$(2') \quad T_{it} = u_{it} [\, Ip_{it} X_{it} - S_{it} L_{it} - q_{it} (v_{it} \delta_{it} + W_{it} r_{it} + \lambda_{it}) K_{it} - p_{it} q_{it} I_{it} \,]$$

Note that the term $\rho_{it} q_{it} I_{it}$ is deducted from the revenue less outlay account irrespective of the amount of profits that are subject to tax, since the allowance of taxes and duties is applied the investment item enters the productive process. With the modification of (2)' equation (10)' becomes

$$(10)' \quad c_{it} = q_{it}\left[\left(\frac{1-\rho_{it}-u_{it}v_{it}}{1-u_{it}}\right)\delta_{it} + \left(\frac{1-\rho_{it}-u_{it}w_{it}}{1-u_{it}}\right) r_{it} - \left(\frac{u_{it}}{1-u_{it}}\right)\lambda_{it}\right]$$

Equation (10)' provides the basic reference equation for the discussion that follows in section 3. As it was mentioned in the beginning the scope of this paper is not the discussion of the concept of the user cost of capital but merely to explain how the various elements can be approximated for the Greek industry. A discussion of the concept of user cost can be found in [31] [33] [47].

III. CALCULATION OF USER-COST

This section describes in detail the derivation of the variables that enter the user cost of capital formula. Most of the variables are in some way or another related (or being functions of) to the net profits per year and sector i. However data for net profits do not exist for the Greek industry and should be estimated. Furthermore, the calculation for example of variables like δ_{it} and v_{it} is based on the assumption that data for capital stock are readily available. However, this is not the case. It is necessary therefore, before proceeding to the estimation of the elements of the user cost formula to discuss how data for capital stock and net profits can be approximated.

Calculation of capital stock

In order to calculate capital stock for each two digit SIC sector of the Greek industry we need to have information on the following : (a) Gross investment per year (b) an assumption about the (useful) life of depreciable assets (depreciation rate) and (c) an evaluation of the existing capital stock at the beginning of the period.

(a) Gross investment per year. Annual industrial surveys provide data on gross investment per year classified according to whether the item is bought new or used and according to the nature of the investment item. There are six categories of investment items : (1) Machinery and mechanical equipment, (2) Buildings, (3) Transport means, (4) Furniture and fixtures, (5) Lots and sites, (6) Other fixed items. For each of the above six categories we have data on new items, used items and sales and destructions. Although it is not permissible to use aggregates of heterogeneous categories of capital, for practical purposes it is useful to condense the above six categories of capital into two as follows : (A) Machinery = (1)+(3) and (B) Buildings = (2)+(4)+(5)+(6), and of course for

each of the above two categories we add items bought (new and used) and deduce sales and destructions. It is possible therefore to obtain data on gross investment per year and sector on machinery and buildings [3].

(b) Depreciation rate. The investment plans of firms are inextribably bound up with decisions concerning whether or not to continue operating the oldest machinery and equipment. The need for replacement représentes a reduction of the capacity in capital stockin the current period to produce a flow of capital services in the following period. The assumption is that replamcement investment generated by previous acquisition of capital goods is distributed over time. A particular form of this relationship is based on the geometric distribution of replacement over time. This leads to the hypothesis that replacement investment is proportional to capital stock. Formally

$$IR_{it} = \delta i K_{lt} \tag{11}$$

where I R = replacement investment

δ_{it} = depreciation rate = $1/\lambda$

where λ = useful lifetime of depreciable assets

Furthermore capital stock is generated as follows :

$$K_{it} - K_{it-1} - IR_{it-1} + GINV_{it} \tag{12}$$

where K_{it} = capital stock

$GINV_{it}$ = gross investment

Combining (11) and (12) we have

$$K_{lt} = GlNV_{it} + (1-\delta)K_{it-1} \tag{13}$$

3. Note that there was no AIS during 1962 and consequently data on investment were interpolated. For the years 1958- 1961 there was no complete correspondence between the sectors as presented for 1963 onwards. The data for each sector of the years 1958- 1961 had to be estimated.

which generates capital stock from data on gross investment and an assumption about depreciation rate, δ. Since informa - about δ is not available for Greek industrial sectors, we followed A. Kintis [27] pp. 94 - 95 in assuming δ = 0.02 for buildings implying average useful lifetime of 50 years and δ = 0.05 for machinery implying average useful lifetime of 20 years. The same depreciation rate for machinery is applied to all sectors despite Krengel and Mertens's comment to the contrary ([29] pp. 33 - 34). With these assumptions about δ, total capital stock for each year and sector can be generated as follows :

$$(13.1) \qquad K_{it}^{B} = GINV^{B} + (0.98)K_{I}^{B} - 1$$

$$(13.2) \qquad K^{M}it = GINV^{M}_{it} + (0.95)\, K^{M}_{it-1}$$

$$(13.3) \qquad B+M = {}_{K}B_{it} + KM_{it}$$

where $K.^{M}$, $K^{B}it$ are capital stock in buildings and machinery respectively.

(c) Capital stock in the beginning of the period. Equations (13) are operational provided that we have an estimation for capital stock in the beginning of the period (1958). This is provided by A. Kintis [27] pp. 170- 171. Note that Kintis's data for sectors 27 and 28, 30 and 39, 31 and 32 are aggregated. We assumed that for each of two parts of aggregate data the share of capital stock is equal to the share of investment between each pair at period 1958.

(d) «Accounting» depreciation. The depreciation rate that correspondes to the economic (= useful) life of capital was assumed to 0.02 for buildings and 0.05 for machinery. In practice the State allows higher depreciation rates in the companies in order to stimulate investment through increased profits. These rates differ among companies according to various criteria, such as the kind of depreciable asset, the legal form of the company, the location of the company, according to whether the machinery in Greek or foreignly bought etc. Furthermore various legal decrees passed during the period under examination continuously alter these depreciation rates in the light of industrial development policies considered by each government. Such a perplexity of deprecia-

tion rates granted to business during the period 1958-1977 made it extremely difficult to assess the true accounting depreciation rates without resorting to the use of data drawn from the balance sheets reported by companies with the lee gal form of limited liability and société anonyme. Such an information is unavailable from AIS. The annual editions of the Confederation of Greek Industries (CGI) [8] however, provide such information since they are based on data taken from balance sheets. In particular we have data on Gross Capital Stock in buildings and machinery from which we are able to calculate gross investment, since.

(14) $$GINV^{CG1}_{if} = \text{gross } K.^{CGI}_{it} - \text{gross } K^{CGI}_{it-i}$$

Moreover, CGI also provides data on net capital stock for buildings and machinery from which we can calculate the accounting depreciation rate using equation (13) for buildings and machinery respectively

(13.4) $$\delta^{CGI.B}_{it} = \frac{net^{CGI.B}_{it} - GINV^{CGI.B}_{it}}{net^{CGI.B}_{k^{i}t}} = \text{«accounting» depreciation rate for buildings}$$

(13.5) $$\delta^{CGI.M}_{it} = \frac{net^{CGI.M}_{kit} - GINV^{CGI.M}_{it}}{net^{CGI.M}_{kit}} = \text{«accounting» depreciation rate for malhinery}$$

We are thus able to calculate replacement investment for buildings and machinery both in what we termed «economic» depreciation rate which can be seen as the actual rate of decay and in what we termed «accounting» depreciation rate which is the rate actually permitted to be charged by the State.

Calculation of net profits

It is common practice in the literature to consider as profits the difference between value added and labour cost. However this can not be considered as net profits since the difference between value added and labour cost contains elements deductible from the current account in the sense that they represent true cost charges[4]. The methodology for the calculation of items deductible from value added and consequently the calculation of net profits before tax is presented below. Information is basically taken from AIS ; whenever this is not the case the sources are stated specifically.

Consider the following relationship

(15) $GVA_{it} GPV_{it} - MB_{it}$

where GVA_{it} gross value added

GPVit = gross production value

MB_{it} = materials bill, containing the value of consumed raw and auxiliary materials, several consumable materials, spare parts, packing materials, fuel, electric energy and payment for contract work

subscripts = refers to each two - digit sector 20 - 39, pl plus total large scale manufacturing, ie i = 1.... 21

subscript =1958-1977, t= 1.. .20

It is clear from equation (15) that GVA_{it} cannot be considered (after the deduction of labour cost) as capital remuneration, given that it still includes depreciation and all those expenditures which do not appear in the form of materials such as services rendered from other sectors of the economy. Following AIS, 1970 and 28, we note

4. Whenever net profits are examined in the Greek industry the sample hat is used is taken from CGI annual publications [8]. See for example [19].

«... the «value added» is a concept much broader than that of remuneration of production factors». The value added in the tables is «gross inventory value added» which is obtained after the deduction of materials consumption from gross production value. The value added therefore includes the following elements : (a) receipts of employed (b) employers contribution to IKA and other insurance agencies (c) remuneration for personal services of proprietors provided that they are not considered as employees (d) depreciation of all kinds (e) insurance premium (f) State taxes except turnover tax and stamp tax (g) interests, commission of banks etc. (h) Advertising (i) other general expenditures for services rendered such as legal advice, agent's commission, storage, transport, payments to experts, postage telecommunications and(j) profit or loss»

By distinguishing between economic and accounting depreciation (see before) we can have the following identities for «economic» and «accounting» profits

(16) $PROF(A)_{it} = GVA_{it} - LB_{it} - (0.175 + LB_{it})\ EMREM_{it} - DEP(EC)_{it} \sim INS_{it} - INTit - ADV_{n} - RENTit - (LAWit + AGENT_{it} + TRANS_{it} + PTT_{it})$

(17) $PROF(B)_{lt} = GVAit\ LB_{it} - (0.175 + LBi_{t}) - PEP.\ (AC)_{it} - INS_{it} - lNTi_{t} - ADV_{it} - RENT_{it} - (LAWitAGENTit + TRANSit + PTTit)$

Each of the above items can be approximated as follows :

GVAit = data drawn from AIS

LBit = receipts of employed, salaries and wages, data drawn from AIS

(0.175*LBn) = employers contributions. Data on labour bill, which include employees contributions, do not include employers contributions to social insurance agencies. Social insurance legislation does not apply a unified premium but on the contrary the contributions vary according to the risk of the job to the location of the firm and to the type of insurance provided (see [13] p. 80). The

premium was assumed to be the same across sectors due to lack of more precise information at a rate of 17.5 %[5].

EMREMit = employer's remuneration. It refers to non - paid family members provided that they work at least 3 hours per day and to employers provided that they are not considered as employees. The latter is the case in most of the personal companies having the legal form of joint stock or partnership. (AIS) provide data on the number of employers and non-paid family members. It was assumed that the average salary is what it would have been paind if they were considered as employees. Average salary is the ratio of salary bill by the number of salaried earners as this is provided by the AIS.

DEP(EC)it = economic depreciation, see before

$DEP(AC)_{it}$= accounting depreciation, see before

INS_{it} = AIS as a note do not provide information on insurance expenditure. Nonetheless AIS 1970 (p. 106-107) provide data on insurance premium from a sample of 2170 industries. On the assumption that information provided by the sample holds true for the population at the same year we are able to calculate insurance expenditure for each sector during 1970. Furthermore insurance expenditure is assumed to be proportional to sales. Since no other information exists, but the 1970 sample, we applied the ratio of insurance expenditure to sales for 1970 for the whole period, 1958- 1977. Insurance was therefore calculated as

$$(18)\quad INS_{it} = \frac{INSil970}{GVPil970} * GVP_{it}$$

INTit = Interest bill plus bank's commission. Data for financial expenditure are not provided by the AIS. Instead information from the annual publications of the confederations of Greek industries [8] was used. Data on financial expenditure as well as borrowed funds are provided by CGI for a sample comprising of the total of companies that have the legal form of limited liability or société anonyme, for each year of the period 1958- 1977. We were thus able to calculate the cost of borrowing by dividing data on financial expenditure by borrowed funds.

5. Note that A. Kintis [27] calculates employers contribution at 17 %, p. 88.

On the assumption that the cost of borrowing funds for the CGI sample is the same for the AIS we only had to calculate the borrowed funds for the AIS sample. Since this information is not provided we proceeded as follows : CGI provides data on fixed capital stock, working capital and borrowed funds. The ratios of (a) working capital to fixed capital and (b) borrowed capital to total capital (fixed and working capital) from the CGI sample were applied to fixed capital from AIS in order to estimate working capital and borrowed capital for AIS firms on the assumption tha the two ratios are the same for both CGI and AIS samples. Multiplying the cost of borrowing by the borrowed funds for we are able to calculate the financial expenditure that corresponds to the AIS firms.

Formally

$$(19)\quad WK_{it} = \frac{WK_{it}^{CGI}}{K_{it}^{CGI\cdot B+M}} * K_{it}^{B+M}$$

$$BF_{it} = \frac{BF_{it}^{CGI}}{(K_{it}^{CGI(B+M)} + WK_{it}^{CGI})} * (WK_{it} + K_{it}^{B+M})$$

$$FE_{it} = \frac{FE_{it}^{CGI}}{BF_{it}^{CGI}} * BF_{it}$$

where

WV_{it} = working capital

BFit = borrowed funds

FE_{it} = financial expenditure

and as before wherever there is no superscript, reference is made to the AIS sample.

ADV_{it}= advertising expenditure. Data on advertising are provided only in two AIS samples, 1963, 1970. We are able to calculate the amount of advertising expenditure per firm in the two samples and by multiplying that with the number of firms from AIS for 1963 and 1970 we can obtain the amount of advertising expenditure for the two years.

Since advertising is a function of sales we can calculate the ratio of advertising to sales by dividing the amount of advertising expenditure in the two sample years to GPVit to those years. The 1963 ratio was used to generate advertising expen diture for the years 1958-1963 and the 1970 ratio for the years 1970-1977. For the years 1963 - 1970 we interpolated between 1963 and 1970 ratios. Formally

(a) 1958 – 1963

$$(22)\quad ADV_{it} = \frac{\frac{ADV^{s}_{163}}{NOF^{s}_{163}} * NOF_{163}}{GPV_{163}} * GPV_{it} \qquad t = 1 \ldots 7$$

(b) 1970 – 1977

$$(23)\quad ADV_{it} = \frac{\frac{ADV^{s}_{170}}{NOF^{s}_{170}} * NOF_{170}}{GPV_{170}} * GPV_{it} \qquad t = 1 \ldots 8$$

where

NOFit is the number of firms (AIS)

and superscript «s» denotes that the data were obtained from the samples described before.

$RENT_{it}$= AIS do not provide information on rent expenditure except for the 1970 sample. We can calculate the rent expenditure per firm in the

sample. On the assumption that rents followed the consumer price index during the period under examination we calculated rent expenditure as

$$(24)\quad RENT_{it} = \frac{RENT^{s}_{i70}}{NOF^{s}_{i70}} * NOF_{it} * Pc_t$$

where Pct = consumer price index (See Monthly Statistical Bulletin, various issues [42]).

LAW_{it} = expenditure on lawyer's offices, accounting offices, organization offices, tax control offices, etc.

AGENTit = agents and brokers commission, research expenditure and patents

$TRANS_{it}$ = transportation expenditure

PTT_{it} = post telephone, telegraph and subscriptions expenditure

The procedure for calculating the above items is the same as that followed for $RENT_{it}$ and ADV_{it}. Formally we have

$$(25)\quad LAW_{it} = \frac{LAW^{s}_{163}}{NOF^{s}_{163}} * NOF_{it} * Pc_t$$

$$(26)\quad AGENT_{it} = \frac{\dfrac{AGENT^{s}_{163}}{NOF^{s}_{163}} * NOF_{163}}{GPV_{163}} * GPV_{it}$$

and similarly for 1970

. . . . .

$$(27)\quad TRANS_{ii} = \frac{TRANS^{s}_{170}}{GPV_{170}} * GPV_{it}$$

$$(28)\quad PTT_{it} = \frac{PTT^{s}_{170}}{NOF_{170}} * NOF_{it} * Pc_{t}$$

Having calculated the elements on the right hand side on equations (16) and (17) it is possible to obtain data on net profits.

Calculation of tax rate u_{it}

The tax rate that is applied on the profits of companies in the Greek industry is not unique. The reason is that there are different tax rates depending on the legal form of the company and other parameters. A company may have the form of a partnership joint stock, limited liability or société anonyme. The first three forms of companies are not taxed as legal entities, but the profits reported are taxed on the names of the shareholders of those companies with a tax rate that depends on the amount of income that the shareholders declare generated from their company and other sources as well (personal income tax). The rate tax applied on société anonymes is different depending on whether the profits are retained or are paid in dividends. Retained earnings are taxed as income of the société anonyme whereas dividends are taxed as personal income of the shareholders according to legislative decrees 3323/1955 and 3843/1958. The latter is further differentiated depending on whether the shares are issued to the bearer or not.

The tax rates on (retained) earnings of the société anonyme are differentiated depending on whether the company draws capital from the public through the Athens Stock Exchange or not and on whether the société anonyme is Greek owned, foreignly owned or has the legal form of a cooperative. The latter distinction does not exactly apply to the tax rate but to the different allowances that are granted to Greek companies vis a vis foreign ones. For example for Stock Exchange companies the tax rate on retained profits is 35 % while for those not in the Stock Exchange for Stock Exchange companies are taxed with 43 % whereas sha-

res that are not issued to the bearer are taxed with 38 %. The corresponding figures for the non-Stock Exchange société anonymes are 43% and 47% [18].

It is clear therefore that a unique tax rate can not be applied as far as equation (10') is concerned. The only way out is to use the effective tax rate. This is constructed as follows : We have two groups of companies : société anonymes (S.A) and personal companies such as partnerships, joint - stocks and limited liability companies (P.C.) First we calculate the share of profits that correspond to (S.A) and the share of profits that correspond to P.C. companies per year and sector. Since the profits of S.A. are taxed differently depending on whether profits are retained or distributed whatwe are interested in is only the retained portion of profits of (S.A.) since the distributed part is taxed as personal income of the shareholders. The following identity is useful.

(29) $PROF(B)_{it} = PROF(PC)_{it} + PROF\ (RT.S.A.)it + PROF\ (Dis.\ S.A.)_{it}$

where

PROF(B)n : «accounting» profits, see before

$PROF(PC)_{it}$: profits of personal companies

PROF (RT.S.A.)it : retained profits of S.A. companies

$PROF\ (DIS.\ S.A.)_{lt}$: distributed profits of S.A. companies

Annual publications by the National Statistical Service of the bulletin «Statistics of declared income and taxation of legal entities» (40) are useful on that. Information is provided through the table «legal entities reporting net profit or loss by kind of legal form by sector of industrial activity» which contains information on the following items : (a) net income based on balance sheets ; it is the income reported on balance sheets through the usual accounting procedures, (b) Net income reported after tax reformulation[6]. This is different from the previous items since it is common practice in some companies to deduce items from the profit accoutnt of their balance sheets that are not always what the law allows them to deduce (c) taxable (retained) income (d) tax due, (e) non-taxable (retained) income and (f) loss. A second table in the same

6. For a precise definition of total net income based on balance sheets and total net income after tax reformulation see [40] pp. 7 and 8.

bulletin provides information on the following : (a) Untaxed income according to various legal decrees such as l.d. 4002/59, law 147/67, l.d. 1313/72 and l.d. 331/74 (b) Distributed income and (c) retained income. Retained income of société anonymes can then be defined in the terminology of the «statistics of declared income and taxation of legal entities» bulletin as

(30) (Retained Income S.A.)it = (Net income reported after tax reformulation)it[6].

+(Non taxable retained income)

- (Loss)it-

- (Distributed income)it

Thus far the shares of two different (in the taxable sense) categories of profits ; retained profits of (S.A.) and profits of personal companies (P.C). To arrive at a figure for un used in equation (10') we have to estimate the tax rates of the two categories of profits just mentioned.

(1) Tax rate of retained S. A. profits (u_{Ait})

The first table of the «Statistics of declared income and taxation of legal entities» bulletin provides data on tax due. Tax rate UAit is obtained by dividing data on taxes by the retained income of S.A. compa-

(2) Tax rate of distriduted S. A. profits and personal companies (u_{Bit})

The National Statistical Service publishes annually «The Public Finance Statistics» where there is information on income taxation [39]. Tax authorities distinguish family income into six categories one of which refers to merchants and industrialists. We have data on family income reported, exeptions and deductions, taxable income and total tax. The tax rate u_{Bit}s the ratio of total tax over family income for the category «merchants and industrialists». Since there is no detailed information the personal tax rate applies uniformly to all sectors i (u_{Bt}).

Tax rate u_{it} can now be defined as a weighted average of $u_{Ait}$and UBt where the weights have been explained before.

$$(31)\quad u_{it} = u_{Ait}^{*}\frac{PROF(RT.S.A)_{it}}{PROF(B)_{it}} + u_{Bt}^{*}\frac{PROF(DIS.S.A)_{it}+PROF(PC)_{it}}{PROF(B)_{it}}$$

Calculation of δit (economic depreciation)

δ_{it} is the actual depreciation rate that represents the wear and tear of the capital stock. The various assumptions about δ_{it} were explained before. Since we have types of investment assets δit is calculated as the weighted average of the depreciation rate for buildings, δ_{itB} and the depreciation rate for machinery δitM, where the weights are the proportion of capital stock in buildings (KITB) to total capital stock, and the proportion of capital stock in machinery to total capital stock.

Formally,

$$(32)\quad \delta_{it}^{B+M} = \delta^{B*}_{it}\frac{K^{B}_{it}}{K^{B}_{it}+K^{M}_{it}} + \delta^{M*}_{it}\frac{K^{M}_{it}}{K^{B}_{it}+K^{M}_{it}} = \frac{0.02K^{B}_{it}+0.05K_{i}^{M}{}_{t}}{K^{B}_{it}+K^{M}_{it}}$$

Calculation of v_{it}

V_{it} is the proportion of depreciation that is charged against revenue less outlay on current account for tax purposes. As it was mentioned before one of the incentive schemes used by the State to générale investment is the depreciation rate that firms are allowed to charge against their profits. A number of legal decrees have enacted increased depreciation rates throughout the period under study aiming to stimulate investment growth based on various criteria such as the geographic location of the company, the technology of the investment asset, the amount of annual investment that the firm would undertake, the destination of the products (exported or to home markets), the branch of manufacture[7] etc. since vit is the proportion of depreciation rate that is deduced from profits for fax purposes it can be defined as the ratio of «accounting» to «economic» replacement. Economic and accounting depreciation have been defined previously. Vit is therefore defined as

7. See also [49].

$$(33)\quad v_{it} = \frac{(\delta^{CGI.B*}{}_{it}\ K^{B}{}_{it}) + (\delta^{CGI.M}{}_{it}\ K^{M}{}_{it})}{(K^{B}{}_{it} + K^{M}{}_{it}) * \delta^{B+M}{}_{it}}$$

Calculation of investment implicit deflator qit

There are two types of investment assets ; buildings and machinery. The implicit deflator for total investment is the weighted sum of price for investment in buildings and price for investment in machinery. The weights are the proportion in gross investment in buildings to total gross investment and the proportion of gross investment in machinery to total gross investment, all expressed in con-otant 1970 prices.

The price of investment in buildings was approximated as follows : National in current and constant 1970 prices for the following categories : Dweillings, Other Building s, Other Construction and Works, transport equipment and other equip-ment[8]. $P_{\substack{TI>TAI \\ INV_{It}}}$ was calculated as the ratio of the sum of «other buildings» and «other construction and works» in current and constant 1970 prices. Due to lack of more detailed information it was further assumed that this price is the same for all industrial sectors i.

The same is not true for investment in machinery P^{M} where for example the typical investment unit in textiles is not the same as that for chemical industries. Prices for machinery that correspond to the two digit industrial sectors were pro" videdby the Center of Planning and Economic Research. For estimation of $P^{M}_{INV_{ti}}$ for total large scale manufacturing industry we used information from T. Scountzos [48].Since $P^{M}_{IWV_{INV_{it}}}$ s the only variable so fat that can not be generated from pu-Wished sources the data are given in table 1. q_{it} can then be estimated as

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8. See National Accounts of Greece 1958-1975, pp. 122-125 and 152-155 [36] and Pro-visional National Accounts pp. 68 and 79 [37].

$$(34)\quad q_{it} = P^{B}_{INV_t} * \frac{\dfrac{GINV^{B}_{it}}{P^{B}_{INV_t}}}{\dfrac{GINV^{B}_{it}}{P^{B}_{INV_t}} + \dfrac{GINV^{M}_{it}}{GINV^{M}_{it}}} + P^{M}_{INV_{it}} * \frac{\dfrac{GINV^{M}_{it}}{P^{M}_{INV_{it}}}}{\dfrac{GINV^{B}_{it}}{P^{B}_{INV_t}} + \dfrac{GINV^{M}_{it}}{P^{M}_{INV_{it}}}}$$

Calculation of cost of capital r_{it}

There is no consensus in the literature as to the way that this variable should be defined. The reason is that the structure of financing of industry is different among countries and consequently the variables that constitute r_{it} can not be unique. The peculiarities of the Greek financial system with special emphasis to capital financing in the industry have been discussed by many authors notably Galanis [12], Psilos [46], Ellis [10], Lolos [32], Andreadis [1] and recently Harissopoulos [16], Halikias [14] and Tsoris [49].

In principle industrial investment in Greece may be considered to have the following sources of finance :

(A) External sources: Borrowing from banks or non-banking institutions which can be short-term or long-term financing. Short-term borrowing (Al) is used to finance working capital, inventories and credit advances to traded It is not uncommon however for Greek manufacturing enterprises resort to short-term borrowing to finance the acquisition of fixed assets[10]. iLong--term borrowing (A2) is used in principle to finance investment in fixed assets (buildings and machinery). Yet again it is rather common practice, particularly for large industrial companies to use long-term borrowing to finance their working capital[11]. Evidence of the fact that long-rterm bank funds are invested not in fixed assets but in inventories and accounts receivable is also provided by Bitros (4).

9. See [45], pp. 203-212
10. See [11] [14].
11. See [28] [50]

TABLE 1

P^{M}_{INVit} Implicit deflator for investment in machinery and mechanical equipment large scale manufacturing, two digit SIC sectors

YEAR	TOTAL	20-21-36	22-27-28 29-30-31	23	24	25-26	32-33	34	35	37	38	39
1958	0.568	0.584	0.596	0.577	0.584	0.577	0.596	0.559	0.563	0.641	0.615	0.651
1959	0.662	0.680	0.694	0.672	0.680	0.672	0.694	0.651	0.655	0.747	0.716	0.758
1960	0.721	0.741	0.757	0.732	0.741	0.732	0.757	0.710	0.715	0.814	0.781	0.826
1961	0.726	0.746	0.761	0.737	0.746	0.737	0.761	0.714	0.719	0.820	0.786	0.831
1962	0.826	0.849	0.866	0.838	0.849	0.838	0.866	0.813	0.818	0.933	0.894	0.946
1963	0.828	0.884	0.905	0.846	0.887	0.849	0.905	0.827	0.830	0.987	0.932	0.987
1964	0.864	0.872	0.894	0.846	0.874	0.874	0.894	0.838	0.827	0.978	0.931	0.978
1965	0.855	0.881	0.897	0.881	0.879	0.879	0.897	0.852	0.863	0.962	0.933	0.996
1966	0.895	0.902	0.914	0.922	0.898	0.893	0.914	0.870	0.890	0.961	0.932	0.984
1967	0.925	0.923	0.932	0.947	0.922	0.933	0.932	0.877	0.902	0.964	0.937	0.970
1968	0.967	0.917	0.924	0.941	0.916	0.933	0.924	0.871	0.910	0.954	0.941	0.974
1969	0.934	0.938	0.939	0.950	0.936	0.938	0.939	0.929	0.948	0.952	0.948	0.976
1970	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1971	1.152	1.079	1.071	1.105	1.080	1.061	1.071	1.122	1.085	1.042	1.066	1.083
1972	1.336	1.173	1.165	1.222	1.174	1.229	1.165	1.221	1.187	1.132	1.275	1.194
1973	1.495	1.372	1.350	1.462	1.373	1.435	1.350	1.448	1.368	1.266	1.402	1.384
1974	1.754	1.572	1.538	1.679	1.572	1.740	1.538	1.805	1.814	1.406	1.581	1.559
1975	2.105	1.829	1.796	2.126	1.828	2.079	1.796	2.138	1.981	1.669	1.808	1.829
1976	2.447	2.228	2.154	2.396	2.227	2.472	2.154	2.496	2.229	1.872	2.292	2.096
1977	2.739	2.493	2.410	2.682	2.492	2.767	2.410	2.793	2.495	2.095	2.565	2.346

(B) Internal sources. Internal sources of finance are considered to be retained earnings and depreciation allowances, since borrowing from the public through the Stock Exchange is practically unavailable. The ratio of own funds to borrowing was and is very low for the Greek manufacturing as a whole ' in some sectors in particular where concentration by large companies is high such as 22 (tobacco industries), 23 (textiles) 27 (paper and pulp) and others, the ratios of own to borrowed capital are extremely low. This is believed by many authors[12], to be probably the most serious impediment to industrial growth in Greece particularly when one considers the fact that industrialization process in other countries was based for the most part on internal sources of funds, especially on the accumulation of retained profits [13].

In the light of the above, the definition of r_{it} has to be conducted in a way that incorporates all the sources of investment financing practically used by Greek industrial firms. r_{it} is therefore defined as a weighted average of the short-term interest rate, the long-term interest rate and the rate of return on (own) capital, where as weights we used the share of short-term borrowing, long-term bor" rowing and own capital to the sum of total horrowing plus own capital for each sector i and year t.

Formally

$$(35) \quad r_{it} = r^*_{1it}\frac{SB_{it}}{SB_{it}+LB_{it}+OF_{it}} + r^*_{2it}\frac{LB_{it}}{SB_{it}+LB_{it}+OF_{it}} + r^*_{3i}\frac{OF_{it}}{SB_{it}+LB_{it}+OF_{it}}$$

where

$r_x$it = short - term interest rate

$r_2$it = long - term interest rate

$r_3$it = rate of return on (own) capital

SBit = short-term borrowing

LBit = long - term borrowing

OFit = own funds

12. See [14] [28]
13. See [30]

OF_{it}

Data on borrowed funds (BF_{it}) that correspond to the AIS sample were estimated previously as well as data on working capital (WK_{it}) Since total capital (TC_{it}) is the sum of working capital and fixed capital stock we can approximate own capital OFitas

(36) $$OFit = TC_{it} - BF_{it} = WKn+Kit-BFit \cdot$$

SBit, LBit

Data on borrowed funds are distributed between short-term'(SBit) and long-term (LBit) according to the information provided by the Bank of Greece, monthly bulletin [2] on the «breakdown of credit to industry by sectors» by using outstanding balances at the end of the period. Since the Bank of Greece sample of industries is larger than that of AIS, the usual working assumption is made that the proportion of short and long-term borrowing that exists in total industry per sector and year is the same to that of large scale industry respectively. There is a possibility however that the shares thus generated are biased upwards with regard to short-term borrowing and downwards with regard to long - term borrowing, since in effect there is no long - term borrowing in small firms (less than 10 persons employed) [44]).

r1i,t r_{2it}.

The interest rates on short and long - term borrowing were taken from the Bank of Greece monthly bulletin table «interest rates on bank credits» and refer to the maximum of interest rates per period. In addition to the interest rates we added a commission of 1 % that is charged for working capital (short-term loans) and 0.5% for long-term loans. Both interest rates varied very slightly throughout the period 1958-1977. Whenever there was a change within a year the interest rate was calculated as a weighted sum.

r a i t . .

It is defined as the ratio of PROF(A)it to OFit

Calculation of w_{it}

It is thé proportion of the cost of capital that is deduced from profits for tax purposes. D.W. Jorgenson and S.A. Stephenson (24) define w_{it} as the ratio of net monetary interest to the total cost of capital. Net monetary interest is defi" nedas

$$(37) \quad r^*_{it} = r^*_{1it} \frac{SB_{it}}{BF_{it}} + r^*_{2it} \frac{LB_{it}}{BF_{it}}$$

Total cost of capital is defined by D.W. Jorgenson and S.A. Stephenson 24] as the product of the cost of capital (r_{it}), capital slock in constant prices and the price of investment goods q_{it}

Capital stock in constant (1970) prices is given by

$$(38) \quad K^*it = K^*_{,t}{}^{<B>} + K^*it^{iM>}$$

where

$$K^{*(B)}_{it} = \frac{GINV^{B}_{it}}{PINV^{B}_{it}} + (0.98)\ K^{*B}_{it-1}$$

$$K^{*(M)}_{it} = \frac{GINV^{M}_{it}}{PINV^{M}_{it}} + (0.95)\ K^{*M}_{it-1}$$

It is obvious that to calculate the above formulas we need to have capital stock in the beginning of the period 1958, in constant prices. Dur to data unavailability for investment prices and capital stock 1958 (see [29]) we assumed that capital stock for 1958 can be deflated by the investment implicit deflator. That is

$$K^{*(B)}_{i_{1958}} = \frac{K^{(B)}_{i\ 1958}}{P^{B}_{INV,1958}}$$ and

$$K^{*(M)}_{i_{1958}} = \frac{K^{(M)}_{i_{1958}}}{P^{M}_{INV,\ 1958}}$$

wit can therefore be defined as

$$(39)\quad w_{it} = \frac{r^{*}_{it}}{r_{it}q_{it}K_{i}{}^{*}{}_{t}}$$

Calculation of p_{it}.

pit is the percentage of duties and tax allowances on investment. «Public Statistics» [39] provide tables containing data on the value of imports and on import duties and other taxes on the various categories of the Greek customs tariff book. Out of the categories of commodities the one corresponds to imports of capital goods is category 16, «machinery and mehanical appliances, electrical equipment, parts thereof». Note that imports of machinery do not refer to industry alone but to the total of Greek Economy. From these tables we can calculate the following : (a) The value of imports of category 16 (b). The value of imported machinery that is not subject to duties and tax (mostly turnover tax) for various reasons, (c) The percentage of duties and taxes that would be charged, if the non taxable amount was being taxed. The product of (b) and(c) gives the value of duties and taxes not collected, ie. gives the value of duties and tax allowances (DUTt)

pt can be defined as the ratio of DUTt by $GINV^{M}_{TOTt}$

i.e.

$$(40) \quad \rho_t = \frac{DUT_t}{GINV^{M}_{TOTI}}$$

Note that there is a serious possibility that the value of pt is overestimated since the denominator is not the amount of investment in machinery of the total economy as it should in principle be, but the total investment in machinery in industry. On the other hand, had we divided DUTt by the total (economy) investment we would have underestimated p_t significantly, since duties allowances usually (but not exclusively) refer to industrial investment. Note also that pt is the same for all sectors i, since sectoral information does not exist[14].

Calculation of in. estment allowanes λ_{it}

Governments frequently attempt to stimulate aggregate investment with the use of various investment schemes in conjunction with the corporate income tax. Some of the more common incentives will be discussed below. In that sense λ_{it} can be seen to denote the proportion of total capital that is deducted from profits in order to cover the value of investments, future losses etc.

During the period under examination various legislative decrees of major or minor significance were passed all of which were directed in easing the conditions for industrial development. During the late sixties and early seventies most of these laws were concenred primarily with regional industrial policy[15]. The most important ofthese laws are :

(1) legislative decree 4002/59 as amended by law 4171/61 further amended by legislative decree 916/71 «on taking of general measures for the assistance oft he economic development of the country». This law gave the option to Greek industrial, artisan and mining companies to deduce from taxable profits any amount of investment expenditure during each fiscal year up to 90 % at the maximum.

14. Manassakis's [34] approach in calculating pt is different since he uses different data from the «Public Finance Statistics» [39] referring to duties and taxes not collected for the total of industry. His results for pt are probably overvalued as well, since he accepts duties allowances do not exclusively refer to capital investment goods but to raw material inputs as well.

15. For a survey ofthese laws, see G.Cottis [9], pp. 176- 180.

(2) law 147/67 on «incentives of industrial development» by which industrial and mining companies are allowed to deduce the whole amount of any investment from corporate income tax. Moreover this law established various other incentive schemes through increased depreciation rates or subsidization of interest for long - term bank borrowing.

(3) legislative decree 1078/71 «on taxation and other measures for strengthening regional development» by which some of the allowances of the previous laws were abolished with regard to industries in the Athens and Salonica areas, particularly the articles dealing with incentives concerning the generation of own working capital by firms.

(4) On a similar spirit is the legislative decree 1313/72 «on measures strengthening tourist development» by which it was established that domestic industrial, artisan, mining, hotel and other tourist companies are allowed to deduce from their net profits a percentage ranging from 50% to 100 % (depending on the geographic location of the company) of their new investment Legislative decrees 1078/71 and 1312/72 were amended by l.d. 1377/March 1973 which regulates since then the questions of industrial development and its regional decentralization.

(5) Finally legislative decree 331/March 1974, introduced a reduction of the nterest rate by two units and granted tax-free reserves for investment made 31-12-75 by 40%.

In order to calculate λ_{it} we should estimate the allowances provided by the laws explained so far, and then divide the amount of the various allowances by he capital stock for each year and sector. That is

$$\lambda_{it} = \frac{\text{allowances}_{it}(4002/59+147/67+1078/71+1313/72+331/74)}{K_{it}^{B+M}} \tag{41}$$

Data for allowances are provided analytically for the laws mentioned above in the «Statistics of declared income and taxation of legal entities» bulletin [40]. κ^{B+M}_{it} was explained before.

TABLE 2

C_{it} User cost of Capital ; Large scale manufacruring, two digit SIC sectors

YEAR	TOTAL	20	21	22	23	24	25	26	27	28
1958	0.0673	0.0715	0.0654	0.0598	0.0684	0.0735	0.0587	0.0626	0.0605	0.0771
1959	0.0731	0.0762	0.0679	0.0638	0.0744	0.0699	0.0645	0.0667	0.0686	0.0803
1960	0.0768	0.0783	0.0743	0.0627	0.0786	0.0696	0.0631	0.0678	0.0708	0.0751
1961	0.0834	0.0873	0.0814	0.0724	0.0852	0.0729	0.0734	0.0608	0.0789	0.0916
1962	0.0973	0.0939	0.0922	0.0841	0.1021	0.0883	0.0828	0.0800	0.0991	0.1010
1963	0.0933	0.0909	0.0966	0.0793	0.0913	0.0835	0.0796	0.0758	0.0981	0.1105
1964	0.0936	0.0915	0.0914	0.0780	0.0959	0.0846	0.0760	0.0855	0.0882	0.1072
1965	0.0995	0.0984	0.0939	0.0792	0.0984	0.0887	0.0788	0.0875	0.0849	0.1057
1966	0.0999	0.1015	0.0982	0.0898	0.1081	0.0915	0.0821	0.0893	0.0955	0.1077
1967	0.1057	0.1067	0.0924	0.0877	0.1084	0.0911	0.0906	0.0960	0.0941	0.1149
1968	0.1089	0.1047	0.0994	0.0812	0.1087	0.0962	0.0844	0.0961	0.0966	0.1121
1969	0.1022	0.0953	0.0951	0.0903	0.1052	0.0933	0.0763	0.0942	0.0945	0.1098
1970	0.1098	0.1095	0.1086	0.0941	0.1148	0.0972	0.0791	0.1046	0.1118	0.1181
1971	0.1142	0.1172	0.1109	0.0998	0.1204	0.0850	0.0896	0.1064	0.1041	0.1204
1972	0.1345	0.1259	0.1183	0.1159	0.1330	0.1080	0.0859	0.1159	0.1212	0.1276
1973	0.1628	0.1623	0.1474	0.1363	0.1680	0.1357	0.1210	0.1500	0.1430	0.1551
1974	0.2419	0.2375	0.2272	0.2012	0.2422	0.2151	0.1988	0.2361	0.2333	0.2454
1975	0.2736	0.2676	0.2675	0.2459	0.2990	0.2518	0.2097	0.2758	0.2374	0.2799
1976	0.3504	0.3308	0.3231	0.2774	0.3531	0.3159	0.3100	0.3280	0.3001	0.3416
1977	0.4094	0.3910	0.3889	0.3280	0.4152	0.3776	0.3641	0.3851	0.3464	0.4037

TABLE 2

C_{it} User cost of Capital; Large scale manufacturing, two digit SIC sectors — Continued

YEAR	29	30	31	32	33	34	35	36	37	38	39
1958	0.0706	0.0685	0.0710	0.0769	0.0551	0.0587	0.0684	0.0696	0.0668	0.0782	0.0748
1959	0.0761	0.0729	0.0775	0.0860	0.0610	0.0638	0.0718	0.0756	0.0702	0.0808	0.0795
1960	0.0804	0.0797	0.0821	0.0925	0.0657	0.0661	0.0796	0.0815	0.0767	0.0890	0.0771
1961	0.0836	0.0854	0.0876	0.0990	0.0710	0.0757	0.0836	0.0857	0.0735	0.0897	0.0908
1962	0.0946	0.0935	0.0969	0.1157	0.0828	0.0906	0.1049	0.0998	0.0935	0.0965	0.0781
1963	0.0979	0.0948	0.0932	0.1130	0.0744	0.0905	0.0958	0.0977	0.0831	0.0888	0.0960
1964	0.0957	0.0872	0.0815	0.1125	0.0822	0.0782	0.0984	0.0953	0.0880	0.0978	0.0884
1965	0.1003	0.0934	0.0957	0.1123	0.0896	0.0953	0.1020	0.0964	0.0881	0.0979	0.0827
1966	0.1087	0.1033	0.1041	0.1185	0.0871	0.0935	0.1092	0.1032	0.0872	0.1000	0.0957
1967	0.1005	0.1069	0.1084	0.1175	0.0806	0.1004	0.1083	0.1041	0.0900	0.1043	0.0958
1968	0.1049	0.1038	0.1083	0.1122	0.0864	0.0922	0.1049	0.1023	0.0851	0.1060	0.1022
1969	0.1013	0.0975	0.1010	0.1111	0.0931	0.0944	0.1043	0.0943	0.0814	0.1065	0.1031
1970	0.1120	0.1087	0.1121	0.1208	0.0921	0.1113	0.1143	0.1071	0.0820	0.1110	0.1155
1971	0.1137	0.1131	0.1113	0.1234	0.0922	0.0549	0.1209	0.1123	0.0963	0.1137	0.1187
1972	0.1190	0.1248	0.1283	0.1343	0.0999	0.1260	0.1348	0.1219	0.1101	0.1232	0.1286
1973	0.1530	0.1556	0.1476	0.1592	0.1311	0.1679	0.1653	0.1570	0.1365	0.1628	0.1575
1974	0.2321	0.2184	0.2233	0.2210	0.1959	0.2060	0.2597	0.2438	0.1889	0.2512	0.2462
1975	0.2749	0.2238	0.2552	0.2449	0.2364	0.2517	0.2932	0.2742	0.2199	0.2791	0.2815
1976	0.3299	0.2780	0.3005	0.3284	0.2820	0.2981	0.3482	0.3179	0.2817	0.3254	0.3310
1977	0.3913	0.3328	0.3532	0.3812	0.3328	0.3517	0.4122	0.3816	0.3222	0.4026	0.3902

IV. USER COST OF CAPITAL : DATA

Section 3 completed the estimation of all the variables that enter equation (10'). The data for each two digit SIC sector are provided in table 2. It should be clear that the information in table 2 corresponds strictly to equation (10') and the methodology for approximating the variables as discussed in section 3. Nonetheless one can arrive at different data for c_{it} depending on the assumptions used particular with regard to the tax equation. In that sense the approach presented in this paper provides a very analytic framework from which one can deduce the redundant variables according to the particular formulation of the cost of capital equation employed. For example one may assume the tax rate variable u_{it} to be zero, or to use statutory tax rates instead of effective rates, ingnore the capital gains (21), as in the model presented here, exclude the short-term interest rate from the cost of capital variable, etc. A similar methodology has been employed by E.R. Berndt (3) in discussing alternative procedures for measuring the price of capital services with reference to U.S. data.

REFERENCES

1. S.G. Andreadis (1966) «Banking in Greece» in H.W. Auburn (ed) «Comparative Banki η g» Waterlow and son Ltd.
2. Bank of Greece «Monthly Bulletin», various issues.
3. E.R. Berndt (1974) «Reconciling alternative estimates of the elasticity of substitution» discussion paper no 95 University of Brittish Columbia, Vancouver.
4. G.C. Bitros (1981) «The fungibility factor in credit and the efficacy question of selective controls» Oxford Economic Papers, volume 33, pp. 459-477.
5. R. Boadway (1978) «Investment incentives, corporate taxation and efficiency in the allocation of capital» Economic Journal, pp. 470 - 482.
6. G. Break and R. Turvey (1964) «Studies in Greek taxation» Center of Planning and Economic Research, Athens.
7. Center of Planning and Economic Research (1967) «Suggestions on the reformulation of the Greek tax system», Athens in Greek.
8. Confederation of Greek Industries «The Greek Industry» various issues.
9. G. Cottis (1980) «Industrial decentralization and regional development» Institute of Economic and Industrial Research, Special Study 7, in Greek.

10. H. Ellis (1964) «Industrial capital in Greek development» Center of Planning and Economic Research, Athens.

11. D. Galanis (1962) «Prospects and problems of the Greek capital market» Bank of Greece, Athens.

12. D. Galanis (1963) «Sources and methods of financing investment in Greek industry», Bank of Greece, Athens.

13. Th. Georgakopoulos (1977) «In directtaxes and Industry in Greece». Institute of Economic and Industrial Research Athens, in Greek.

14. D. Halikias (1978) «Money and credit in a developing economy: **The** Greek case», New York University Press.

15. R.E. Hall and D.W. Jorgenson (1967) «Tax policy and investment behaviour» American Economic Review 57, pp 391-414.

16. Harissopoulos Committee (1981) «A summary of proposals» Bank of Greece, Athens, in Greek.

17. ICAP «Financial directory of Greek companies», ICAR, Hellas, various issues.

18. J. Joannos (1980) «The effects of the legal form and size on the financial structure of Greek manufacturing firms» SPOUDAI, in Greek.

19. J. Joannos (1984) «Profits, variability of profits and firm size : the evidence from Greek industrial firms» Athens School of Economics and Business Sciences, Scientific Annals.

20. D.W. Jorgenson (1963) «Capital theory and investment behaviour» American Economic Review Supplement 53, pp. 247-259.

21. D.W. Jorgenson (1965) «Anticipations and investment behaviour» in J.S. Duesenberry, G. From, L.R. Klein and E. Kuh (eds) «The Brookings Quarterly Econometric Model of the United States» Chicago,' Rand McNally, pp. 35-92.

22. D.W. Jorgenson (1974) «Investment and production : a review» in M.D. Intilligator and D.A. Kendrik «Frontiers of Quantitative Economics», Volume II, North Holland publishing company.

23. D.W. Jorgenson and CD. Siebert (1968a) «A comparison of alternative theories of corporate investment behaviour» American Economic Review 58, pp. 681-712.

24. D.W. Jorgenson and S.A. Stephenson (1967a) «The time structure of investment behaviour in United States manufacturing 1947 - 1960» Review of Economics and Statistics, pp. 16-25.

25. D. W. Jorgenson and S.A. Stephenson (1967b) «Investment behaviour in U.S. Manufacturing 1947 - 1960» Econometrica 35, pp. 169 - 220.

26. D. W. Jorgenson and S.A. Stephenson (1969) «Issues in the development of the neoclassical theory of investment behaviour» Review of Economics and Statis tics, pp. 346- 353.

27. A. Kintis (1973) «The demand for labour in Greek manufacturing» Center of Planning and Economic Research, Athens.

28. G. Koutsoumaris (1976) «The development and financing of the Greek industry», Institute of Economic and Industrial Research, Athens, in Greek.

29. R. Krengel and D. Mertens (1966) «Fi xed capital stock and future investment requirements in Greek manufacturing» Center of Planning and Economic Research, Athens.

30. S. Kuznets (1955) «(International differences in capital formation and financing» in National Bureau of Economic Research «Capital formation and Economic Growth», Princeton, New Jersey, Princeton University Press.

31. A.P. Lerner (1943) «User cost and prime user cost» American Economic Revi-

e w.

32. L.S. Lolos (1966) «The Banking System» Athens.

33. F.A. Lutz and V. Lutz (1951) «The theory of investment of the firm» Princeton University Press, Princeton.

34. N. Manassakis (1978) «Investment incentives and investment function in the Greek industry» SPOUDAI, pp. 787 - 812 in Greek.

35. N. Manassakis (1982) «Investment and financing of Greek industry» in the «Greek Economy», Bank of Greece, Athens, in Greece.

36. Ministry of Coordination (1976) «National Accounts of Greece 1958 - 1975» number 23, Athens.

37. Ministry of Coordination (1980) «Provisional national accounts of Greece», Athens.

38. R.A. Musgrave and P.B. Musgrave (1980) «Public finance in Theory and Practice» McGraw - Hill, third edition.

39. National Statistical Service of Greece «Public Finance Statistics», various issues.

40. National Statistical Service of Greece «Statistics of declared income and taxation of legal entities», various issues.

41. National Statistical Service of Greece «Annual (ndustrial Surveys», various issues.

42. National Statistical Service of Greece «Monthly Statistical Bulletin», various issues.

43. S.S. Nickell (1978) «The investment decisions of firms», Cambridge Economic Handbooks.

44. K. Nicolaou (1978) «Intersize efficiency differentials in Greek manufacturing», Center of Plannina and Economic Research, Athens.

45. L.E. Peston (1968) «Consumer άoods marketing in a developing Economy», Center of Planning and Economic Research, Athens.

46. D. Psilos (1964), «Capital market in Greece», Center of Planning and Economic Research, Athens.

47. A.D. Scott (1953) «Notes on User Cost», Economic Journal, pp. 364 - 384.

48. Th. Scountzos (1979) «Net fixed capital stock in the GreekEconomy», Athens.

49. N. Tsoris (1984) «The financinn of the Greek manufacture» Center of Planning and Economic Research, Athens.

50. E. Tsoutrellis (1963) «Lending to industry and policy» Athens, in Greek.