Institute of Economic Development and Research
SCHOOL OF ECONOMICS
University of the Philippines

Discussion Paper No. 67-2 Revised June, 1967

INVESTMENT DEMAND IN PHILIPPINE MANUFACTURING

by

Richard W. Hooley & Gerardo P. Sicat

F O R E W O R D

The study which we present here is the result of two separate research projects at the School of Economics -- Hooley's Financial Study and Sicat's Manufacturing Study. These projects are being supported jointly from resources made available by the School of Economics, University of the Philippines and the Rockefeller Foundation.

The data on which this study is based were taken from Hooley's flow of funds worksheets. We would like to acknowledge the help of Mrs. Honorata A. Moreno in the collection and analysis of the accounting data from individual firms. The computations were made possible by a special grant to Sicat which enabled him to spend the Fall Term, 1965-66, as a Guest at the Department of Economics of the Massachusetts Institute of Technology. Although there is division of labor in the mechanical aspects of this research, the findings and interpretation are the result of close collaboration.

Professors J. Encarnación and Jeffrey G. Williamson gave our first draft a critical reading, for which we are grateful. In addition, we have benefitted from comments made in a faculty seminar at the School of Economics. We would like to thank the institutions and the host of assistants who have helped us.

R.W.H. & G.P.S.

Quezon City, Philippines
April, 1967/Revised June, 1967

TABLE OF CONTENTS

I. INTRODUCTION

In recent years economists have devoted increasing attention to the study of the nature of business investment behavior in the developed countries. However, work in the less developed countries has lagged far behind. Doubtless the lack of good data on business investment in these countries has been a factor. But students of economic development are also partly to blame for paying little attention to the nature of business investment demand. As Professor Solow has pointed out

> Theories of economic growth often minimized the problem of effective demand. In analyzing economic development and industrialization it was usually assumed that the only limit to net investment was the volume of net savings from all sources.... [I] would pose this now as a question for historians and students of underdeveloped countries. If private investment was not always straining against the volume of saving, what held it back? What sort of an investment behavior equation would be reasonable for a society just beginning to industrialize?[1]

---

[1]Remarks of Robert Solow at the Conference on the Economics of Take-Off into Sustained Growth as quoted by Douglas Hague in W.W. Rostow (ed.), *The Economics of Take-Off Into Sustained Growth* (London, Macmillan, 1963), pp. 470-471.

The present study tests a variety of investment demand functions using data from about 170 manufacturing firms. The demand functions are developed from hypotheses which emerge from the theoretical literature on the nature of business behavior and, more specifically, on the determinants of business investment. As applied to the less developed countries, not only the approach but also the data are novel. The authors have not been able to find any econometric study utilizing micro data covering business firms in these countries. Hence the paper devotes somewhat more time than might otherwise have been warranted, to the problem of measurement and to the background material necessary for the interpretation of these data.

II. THE DETERMINANTS OF INVESTMENT

Economic theory suggests a number of variables which are likely to play an important role in determining the level of investment. In classical theory, entrepreneurs adjust investment levels to the expected rate of return. Tinbergen and Polak[1] have suggested that if present profits are taken as a proxy for future profits (by way of a naive anticipation model), investment outlays ought to be closely related to levels of current profits.

Changes in sales are also thought to be an important variable affecting investment behavior. As originally formulated by J. M. Clark, the acceleration principle points to a relationship between the volume of fixed investment and the rate of growth of sales. Later formulations have simply posited a relationship between the volume of investment and the level of sales. Since presumably it takes time to adjust investment plans to changes in sales, the relationship is usually stated in terms of one or more lagged variables. For example,

$$I_t = \beta S_t - K_{t-1}$$

---

[1]J. Tinbergen and J.J. Polak, *The Dynamics of Business Cycles* (University of Chicago Press, 1950), pp. 166-67.

where I is net investment, K is capital stock, S is sales, β is a coefficient measuring the desired capital-output ratio and the subscript t indicates the time period.

A question arises as to whether businessmen, in planning investment outlays, take a long or short-run point of view. It may be, for example, that businessmen do gear investment to sales, but not to sales in any period unless confirmed in the immediately succeeding period. This case may be viewed as a process of "averaging out" sales in recent periods and might be expressed as follows:

$$I_t = \beta \left[\frac{S_t + S_{t-1}}{2}\right] - K_{t-1}$$

where I, S, K and β have the same definitions as previously given to them. The particular formulation that one prefers in this regard -- i.e., past-period sales or some combination of past and current period sales.

It may not be possible to execute investment decisions in one period, as implied in the above formulation. Besides decision lags, there are gestation lags. Chenery and Koyck have suggested introducing a reaction coefficient to give more realism to the pure accelerator. If this is done the model becomes

$$I_t = \alpha(\beta S_t - K_{t-1})$$

where I, S, and K have the meanings assigned to them previously, and α is a reaction coefficient subject to the condition that $0 < \alpha \leq 1$. In this formulation the total amount of investment induced by an increase in sales is spread out over a number of time periods, and the coefficient α tells us what fraction of it is induced in time period t. The inclusion of a reaction coefficient is probably most justified where investment consists of large structures or highly complex machinery and equipment, such as one is likely to find in the plants of electric utilities and of durable manufacturing industries. It is least justified in industries like light manufacturing, where investment is likely to consist of simple structures and relatively standardized types of machinery.

Liquidity is sometimes stressed as an important determinant of business investment. Liquidity can be defined in a variety of ways, but there are two elements of major importance: the size of the cash flow (essentially retained earnings plus accrued depreciation) and the stock of liquid assets on hand at the beginning of the period. In their empirical work on U.S. corporations, Meyer and Kuh found liquidity to be an important factor influencing investment behavior.[3]

/ It has been argued that dividend policy can be an important determinant of business investment. Many firms, especially the larger ones, adopt a policy of maintaining a constant dividend.[4] By definition, retained earnings are the sum of the net profits (P) plus depreciation (D) less dividends (d), i.e.,

$$R = P + D - d.$$

Since D is virtually a constant by definition, and if d is a constant, then the full amount of changes in P is reflected in R. This is equivalent to saying that the proportional variation of R is greater than P.

These determinants of investment suggested by economic theory have been discussed and sometimes tested against

---

[3]Meyer and Kuh, *The Investment Decision* (Harvard University Press, 1955).

[4]J. Lintner, "Distribution of Incomes of Corporation Among Dividends, Retained Earnings and Taxes," *American Economic Review*, May, 1956.

the background of developed economies. Only recently have economists given explicit attention to the theoretical issues involved in framing models of investment behavior in less developed countries. One important approach is contained in the well-known Lewis model.[5] Lewis holds that in these countries a "profits push" is the primary -- indeed virtually the only important -- determinant of investment. His position on this issue is explicitly recognized when he says that entrepreneurial profits are the main source of business investment funds.[6] This view is, of course, implicit in Lewis entire position on growth, and is therefore in all Lewis-type growth models (such as the Ranis-Fei model). If labor is unlimited in supply, and the real wage rate is constant at or near subsistence, any improvement in the returns to the firm go to capital. At least over the short-run when the productivity of capital is not changing, reinvestment will be some simple function of profits. This literally amounts to asserting that

$$I = \alpha P$$

where I and P indicate investment and profits, respectively, and α is a constant.

---

[5] "Economic Development with Unlimited Supplies of Labor," *Manchester School*, May, 1954. Reprinted in a number of collections like those of Agarwala & Singh and of Morgan, Betz, & Choudhry.

[6] A Lewis, *The Theory of Economic Growth*, Homewood, Ill. Irwin, 1955, pp. 225-244.

A different view of investment behavior in less developed countries is suggested by Higgins. He holds that investment is mainly induced by shifts in demand -- i.e., aggregate demand -- which reflect growth of income, and by changes in population and so forth.[7] Higgins' investment equation is written

$$I = I_i(\dot{Y}) + I_A(\dot{K}, \dot{T}, \dot{L})$$

where: I_i and I_A are induced and autonomous investment, respectively

$\dot{Y}$ is the rate of growth of income

$\dot{K}$ is the rate of growth of capital stock

$\dot{T}$ is the rate of growth of technology

$\dot{L}$ is the rate of growth of population.

Higgins' approach suggests that entrepreneurs undertake new investment in response to increases in aggregate demand, brought about by increases in income, population and so forth. It differs from the Lewis formulation in a fundamental way. The inference that can be drawn from his presentation is that profitability enters as only one of many determinants, through $\dot{K}$ and sometimes through $\dot{T}$. Unfortunately, however, Higgins formulation leaves the form of the investment demand equation

---

[7] Benjamin Higgins, *Economic Development* (W.W. Norton, New York, 1959), p. 35.

unspecified, so that it is not possible to develop tests of his hypothesis without further refinements to the theory. The important point to make, however, is that these two approaches -- the Lewis reinvestment thesis and the Higgins demand induced thesis -- are fundamentally inconsistent. There can be no assurance whatever that firms which gear their investment plans to changes in demand will automatically generate the volume of retained earnings necessary to finance such expansion.[8]

The existence of firms which gear their investment plans to the market rather than retained earnings seems to underlie the thinking of J.G. Gurley and E.S. Shaw.[9] They recognize the need to explain the appearance of a demand for external financing that accompanies economic development. This phenomenon has been observed for a great many developed and developing countries. They reasoned that the demand

---

[8]Except under very restrictive assumptions, including that all relevant cost and revenue curves are linear throughout. On this see S.C. Tsiang, "Accelerator Theory of the Firm and the Business Cycle," *Quarterly Journal of Economics*, August, 1951.

[9]*Money in a Theory of Finance* (The Brookings Institution, Washington, 1960), esp. pp. 99 ff.

for external financing must result from the excess of investment requirements over available business saving. Their argument can be expressed as follows.

$$E = \frac{(n-\pi)K/Y}{1-(i/n)}$$

where E = fraction of real external financing to real output

n = rate of growth of output

π = real rate of profit

K/Y = capital-output ratio

i = rate of interest.

Given the rate of profit, the interest rate, and the capital-output ratio, the demand for external financing depends purely on output growth. This is the reasoning that is implicit in their writing. But this reasoning assumes an accelerator-type investment demand function. From this point of view their expression is not a demand function for investment funds which are obtained from external sources. The importance of the Gurley-Shaw formulation, however, is the explicit recognition of the importance of an investment demand function as a link between the growth of output on the one hand, and the growth of the financial super-structure on the other.

In the above discussion, attention has been directed primarily to the question of what variables to include in the demand equation. Aside from this there is an equally important question concerning the nature of the function. Some approaches implicitly assume that it is linear, which then suggests testing an equation of the type

$$I = \alpha + \beta_1 X_1 + \beta_2 X_2 \ldots$$

Such a formulation assumes that the *level* of investment is directly related to the *level* of the explanatory variables. But there are other approaches to investment that suggest a relationship between its rate of change and that of the dependent variables. In this case the formulation might be

$$\ln I = \alpha + \beta_1 \ln X_1 + \beta_2 \ln X_2 \ldots$$

A third possible approach runs in terms of the rate of increase in the capital stock. This approach views decisions on investment flows as taken with respect to the total capital stock. This might be written

$$\frac{I}{K} = \alpha + \beta_1 \frac{S}{K} + \beta_2 \frac{P}{K} + \ldots$$

It should be realized that these are not simply alternative ways of writing the same relationship. The logarithmic function, for example, reflects a different pattern of behavior than either of the other functions. Each formulation presupposes different types of behavior response on the part of businessmen. Of course, this does not exclude the possibility that two different formulations may give similar results. The point to be made clear is that different formulations reflect different theories about the nature of response.

In all of the above formulations profit appears as an explanatory variable. Actually, the level of profits may enter into investment decisions in two ways. As an expectation, the rate of current profit affects decisions on new investment, because profit is the purpose of investment. Second, profits provide a source of funds for investment, and the level of profits is therefore often closely associated with the volume of investment. In this study we will distinguish between these two meanings of profits by always referring to profits as a rate of return concept by the term "profitability", while referring to profits as a source of finance concept as "profits-push". It must be added that while theoretically these two roles of profits are distinct, in practice they often merge. Thus one firm may expand investment rapidly because it expects to secure a high rate of return on capital, at the same time using funds generated by high profit levels as a primary source of finance. In general, it may be said that when self-finance is a preferred method of financing capital expenditures, use of the level of profits and the rate of profits as explanatory variables for investment will yield similar results.

Most of the theory of investment has been developed with net investment in mind. However, in this paper we have decided to cast our empirical work along lines of gross investment. We have chosen this for two reasons. First, gross investment is just as meaningful for our purposes as net investment. Second, the estimation of depreciation on machinery is generally done, even in the best firms, on a very approximate basis. Consequently estimates of net investment are complicated by any inaccuracies introduced by the estimation procedures.

Throughout what follows investment means fixed investment -- i.e., capital investments in equipment and structures. We exclude inventory from our study of investment.

III. INVESTMENT DEMAND MODELS IN THE STUDY

In terms of the treatment of the firm data the investment models that are tested in this study consist principally of three forms, (1) simple linear, (2) logarithmic, and (3) ratio. As pointed out already, the investment magnitude which is being explained is gross fixed investment demand. The determinants whose influence are being studied consist of sales, the capital stock, net profits, retained earnings, and depreciation. In the case of sales, some variations are made so as to determine how particular sales variables influence the investment decision. This leads therefore to an inclusion of current and past period sales or an average of the two. Current period net profits, retained earnings, and depreciation are included to show the varying influences of each one on investment demand. One important novelty in the investment demand models in this study concerns the inclusion of a dummy variable which identifies all firms in our sample that were granted at sometime or other the tax-exemption privileges of a law which tried to encourage new and necessary industries. More will be said on this matter later.

The investment demand models in this study may be written generally as follows:

(1) Simple linear [SL]

$$I_t = f(S_t, S_{t-1}, K_{t-1}, P_t, R_t, Dum_t, u_t)$$

or, alternatively

$$I_t = f[(S_t + S_{t-1})/2, K_{t-1}, P_t, R_t, Dum_t, u_t]$$

(2) Logarithmic [Ln]

These are the logarithmic versions of the simple linear models.

(3) Ratio

$$\frac{I_t}{K_t} = f\left(\frac{S_t}{K_t}, \frac{S_{t-1}}{K_t}, \frac{P_t}{K_t}, \frac{D_t}{K_t}, Dum_t, u_t\right)$$

or

$$\frac{I_t}{K_t} = f\left(\frac{S_t}{K_t}, \frac{S_{t-1}}{K_{t-1}}, \frac{P_t}{K_t}, \frac{D_t}{K_t}, Dum_t, u_t\right)$$

where the symbols appearing have the following meanings:

I - gross fixed investment

K - capital stock, measured at the end of the year

S - sales

P - net profit after income taxes

R - retained earnings

D - depreciation

Dum - a dummy variable indicating the firms which enjoyed tax-exemption benefits under the law pertaining to new and necessary industries

Dum = 1, if the firm ever enjoyed tax-exemption benefits

Dum = 0, otherwise

u - a stochastic error term

t - year 1962

t-1 - year 1961

All the value figures regressed are in hundred thousand pesos. When ratios were computed, the ratios were all transformed into percentages.

All of the investment equations above were estimated by fitting the data to linear regression equations. Shown below are the precise forms of the regression equations fitted. We add the subscript i to indicate the manufacturing firm in the regression.

(1) Simple linear

SL I

$$I_{it} = \alpha_0 + \alpha_1 S_{it} + \alpha_2 S_{it-1} + \alpha_3 K_{it-1} + \alpha_4 P_{it} + \alpha_5 D_{it} + \alpha_6 Dum_{it} + u_{it}$$

SL II

$$I_{it} = \alpha'_0 + \alpha'_1(S_{it} + S_{it-1})/2 + \alpha'_3 K_{it-1} + \alpha'_4 P_{it}$$

$$+ \alpha'_5 D_{it} + \alpha'_6 Dum_{it} + u_{it}$$

(2) Logarithmic

Ln I

$$\ln I_{it} = \beta_0 + \beta_1 \ln S_{it} + \beta_2 \ln S_{it-1} + \beta_3 \ln K_{it-1}$$

$$+ \beta_4 \ln P_{it} + \beta_5 \ln D_{it} + \beta_6 Dum_{it} + u_{it}$$

Ln II

$$\ln I_{it} = \beta'_0 + \beta'_1 \ln(S_{it} + S_{it-1})/2 + \beta'_3 \ln K_{it-1}$$

$$+ \beta'_4 \ln P_{it} + \beta'_5 \ln D_{it} + \beta'_6 Dum_{it} + u_{it}$$

(3) Ratio

Ratio I

$$\frac{I_{it}}{K_{it}} = \gamma_0 + \gamma_1 \frac{S_{it}}{K_{it}} + \gamma_2 \frac{S_{it-1}}{K_{it}} + \gamma_3 \frac{P_{it}}{K_{it}}$$

$$+ \gamma_4 \frac{R_{it}}{K_{it}} + \gamma_5 \frac{D_{it}}{K_{it}} + \gamma_6 Dum_{it} + u_{it}$$

Ratio II

$$\frac{I_{it}}{K_{it}} = \gamma'_0 + \gamma'_1 \frac{S_{it}}{K_{it}} + \gamma'_2 \frac{S_{it-1}}{K_{it-1}} + \gamma'_3 \frac{P_{it}}{K_{it}}$$

$$+ \gamma'_4 \frac{R_{it}}{K_{it}} + \gamma'_5 \frac{D_{it}}{K_{it}} + \gamma'_6 Dum_{it} + u_{it}$$

These investment demand regression models are used, first, to regress all the firms in our sample and, second, those firms classified into specific groups. The classifications of the firms are justified by the specific objectives that are sought. We are interested (1) in the analysis of the investment behavior of firms in a less developed country whose sizes differ and (2) in the study of the investment behavior of firms serving relatively the same product markets. The first of these objectives has some implications for the theory of growth of the firm. The second has more specific relevance to an understanding of the investment behavior of firms in a given country, in this case the Philippines and of given industries. To achieve the first objective, the firms are grouped in accordance with the size of assets. By keeping the range of firm size small, an investment demand equation can be fitted that shows the behavior of a group of firms whose size may be assumed to be homogeneous. The investment behavior of groups of firms having different sizes can then be compared by comparing different regressions. To achieve the second objective, the firms are classified by industry.

To what extent is investment demand a sales-pull, a profits-push, or a capital stock adjustment phenomenon? These are the traditional questions posed about investment demand. The inclusion of all the listed determinants of investment represents an attempt to examine their effects on investment behavior. The appearance of three different regression models in the specification of the investment equation, on the other hand, paves the way for a comparison of competing economic interpretations. The simple linear regression model has a straightforward interpretation: that investment demand is a linear function of the various determinants with significant influence. The logarithmic equations allows an interpretation of the derived regression coefficients of a variable into investment elasticities with respect to the variable in question. The ratio models may be interpreted differently, depending on the nature of the variables. The ratio model in which the same variable is used as a deflator is just one way of specifying a simple linear model. An example is

$$I_t/K_t = \alpha_0 + \alpha_1 S_t/K_t + \alpha_2 P_t/K_t$$

which may be rewritten as

$$I_t = \alpha_0 K_t + \alpha_1 S_t + \alpha_2 P_t$$

after multiplying both sides of the equation by the deflator variable, K_t. On the other hand, the following

$$I_t/K_t = \alpha_0 + \alpha_1 S_t/K_t + \alpha_2 S_{t-1}/K_{t-1}$$

is nonlinear because it is not possible to make the same transformation as before. In addition to the difference in interpretations offered by having three specifications, transformations into logarithms and into ratios of basic data could help to reduce multicollinearity among variables, when it does happen.

A focal point of empirical studies of investment demand is the pioneering study of Meyer and Kuh.[1] Their study tested ratio models on regressions involving cross section data derived from the records of firms. Their ratio models differ from those presented here only in terms of the deflator (they used K_{t-1} consistently while we use K_t) and in terms of the number of explanatory variables. Specifically, Meyer and Kuh included measures of the age of the capital stock, net

---

[1]J.R. Meyer and Edwin Kuh, *The Investment Decision: Some Empirical Observations*, Harvard University Press, 1957.

liquidity and the degree of capacity utilization. Trial runs on our data indicated that liquid assets were very unpromising as a determinant of investment behavior, and so we dropped it from later computations. We were not able to get data on age of the capital stock for many firms, but from what information was available to us it appeared that probably three-fourths of the capital stock in manufacturing was installed after World War II. Hence the firms in our sample are abnormally homogeneous from the standpoint of age of fixed assets. Thus, even if accurate data were available, age of the capital stock is not likely to be an important determinant of investment under contemporary Philippine conditions.

No data existed at the time the study was made on capacity utilization in Philippine manufacturing. Some work has been done since, however, on capacity utilization coefficients for industry groups.[2] While these measures, derived from a sample survey of manufacturing firms in 1961 are not really adequate for our use, an attempt was made to compare our results, on an industry group basis, with the results of the survey. The results are discussed later in this paper. As far as they go, they suggest that unused

---

[2]R.M. Bautista, "Capital Coefficients in Philippine Manufacturing," *Philippine Economic Journal* (vol. 5, no. 2), Second Semester, 1966.

capacity was not an important determinant of investment behavior during the period covered by our study.

One novelty of our approach is the inclusion of tax-exempt status as an independent variable in the regressions. The importance of tax exemption as a policy tool is too obvious to require special comment. The prominent role assigned to it in achieving industrialization through import substitution is the subject of another study.[3] Its place in this study consists of considering the effect of tax exemption on investment behavior. Actually, as we shall see below, the answer to this question consists not simply in the direct effect of tax exemption on the volume of investment, but on the effect of tax exemption on the other determinants of investment and, through them, on investment.[4]

The regression models we use here bear some affinity in structure with those tested by Edwin Kuh in his most recent work.[5] Although he used a much wider list of alter-

---

[3]This is being investigated by Professor Sicat in his study of Philippine manufacturing.

[4]So far as we are aware, previous studies of tax exemption in the less developed countries have concentrated on the direct effects to the exclusion of the indirect.

[5]Edwin Kuh, *Capital Stock Growth: A Microeconometric Approach* (North-Holland, 1964).

native models of investment demand than ours, broad comparability between our specifications and Kuh's is obvious. With considerably less data limitations, Kuh has been able to push his research much farther. His estimates are based on both cross-section and time series, and on both pooled. This enabled him to apply a wider range of statistical techniques to test the values of the parameter estimates of the investment equations, and for that reason, among others, makes his results potentially more general in their application.

A Priori Restrictions on the Signs of Explanatory Variables

Economic theory gives us some *a priori* expectations on the way economic variables depend on others. In studies of the kind being undertaken here, it is desirable to have these *a priori* expectations laid out clearly before us, so that they may serve as a guide to the interpretation of the statistical results. When *a priori* theoretical restrictions are contradicted by the signs of the regression coefficients, we may conclude that (1) the contradiction of theory by empirical evidence may be spurious if the t-value of the coefficient is not significant at a specified probability level; or (2) that the specification is not correct because the variable concerned competes with a more powerful explanatory variable, and as a result takes on the opposite sign; or (3) there are some special circumstances of an institutional kind which affect the variable under consideration and which therefore require special attention; or (4) that the pattern of behavior hypothesized by economic theory does not obtain in this economy.

To facilitate the discussion on the nature of the *a priori* expectations about the regression coefficients, we shall talk about the signs (i.e., positive or negative) that the coefficients are expected to hold on the basis of theoretical expectations.

The expected signs for the coefficients of S_t and S_{t-1} are all positive. This follows from the notion of the acceleration. Investment demand is viewed as arising from a "sales pull": that is to say, a rise of sales to high levels is expected to be reflected in correspondingly large outlays for investment. However, the coefficient of $(S_t + S_{t-1})/2$ is not known easily. Since it is not known if $S_t \gtrless S_{t-1}$, it is not easily seen how sales will influence investment. If any of the sales variables should be weakly related to investment, or not at all, the expected signs may be violated. For instance, the level of sales during the year observed may not depend on the levels of investment expenditures because longer run anticipations are made which are not based on current levels of sales. Moreover, it may turn out that current and past year's sales are competing explanatory variables. Under these circumstances the more potent sales variable will have a positive sign and the other(s) will not be significant or carry a negative sign. If sales is not an important determinant of investment, then all the sales variables will tend to be non-significant, and generally take on positive or negative signs in a more or less random fashion.

The coefficient of S_{t-1}/K_t may take on a positive or negative sign. In general, this sales variable should have a positive sign, like all other sales ratio variables, in view of our reasoning about sales-pull. But the sign can be negative in the following situation. Consider the case in which there are firms with rapidly expanding plant size and whose previous year's sales are still of relatively low level. Or the reverse case of firms whose previous year's sales have been relatively large compared to rather low level of capital stock.

All coefficients of the profits variable are expected to carry a positive sign following from the character of profit theories. If present profits are considered a proxy for future profits, then high levels of current period profits are said to induce high levels of investment. On the other hand, from the reinvestment theory viewpoint, high levels of profits in the current period are said to be the source for financing correspondingly high levels of investment. We have not allowed for a lag because of the assumption generally made that profits are directly reinvested. The same reasoning holds for the retained earnings variable (R_t) which is also expected to show a positive coefficient throughout.

In a simple capital stock adjustment model of investment demand, the coefficient for the capital stock variable of a previous period, K_{t-1}, would be negative. Investment demand levels would represent simple adjustments that result from the disequilibrium that may exist between the demand for output and the capital stock. Thus, the higher the level of the capital stock in a preceding period for a firm, the less would be the demand for investment. But in investment demand studies from cross-section data of firms, it may also be expected that the coefficient of K_{t-1} could come out positive. Observe samples of firms as they move from small to large. The size of investment outlays would move in the same direction as the level of the capital stock. If a complete control of firm size is made, the expectations via the capital stock adjustment principle, if it is at all a significant factor, will be realized, i.e., a negative K_{t-1} coefficient results. But so long as firms of different sizes are mixed together, a positive value for the K_{t-1} coefficient is not surprising at all.

Gross investment in the current period (I_t) will obviously be directly related to depreciation (D_t) on the assumption that worn out capital equipment is replaced immediately. In a cross section study movements in I and D may not be so closely related. Depreciation accruals will differ from firm to firm, depending on the age and durability of the capital stock of the firms in the sample.

Depreciation may also take on a negative sign when it reinforces other variables. For example, if profits are closely associated with investment except for those firms which show high depreciation rates and if for the latter firms investment is closely related to retained earnings, it can be expected that the relationship between profits and investment is close for all firms, but that some firms choose to use the depreciation accruals as a substitute source for investment finance. This will then show up as a negative sign before the depreciation regression coefficient.

The interpretation of the sign of the dummy variable is important in assessing the effects of tax-exemption policies for manufacturing enterprises. The tax-exempt firms were, we recall, given a value of "1" and non-tax-exempt firms zero. In a regression

$$y_i = \alpha_0 + \alpha_1 Dum_i + \beta x_i + u_i$$

the tax-exempt firm will have a high or low intercept value [$= \alpha_0 + \alpha_1 Dum_i$] depending on whether α_1 is positive or negative, respectively. The intercept of the non-tax-exempt firm is equivalent to α_0, since its Dum value = 0. In general, the expected value of the coefficient of the dummy variable is that it should be positive, for this leads to the interpretation that firms which enjoyed the benefits of tax-exemption would have higher levels of investment expenditures than those without such benefits, all other things remaining the same.

Summarizing, we present below two "signs" tables which show *a priori* expectations concerning the signs of the parameter estimates for different regression equations.

A PRIORI EXPECTED SIGN TABLE OF COEFFICIENTS FOR SIMPLE LINEAR AND LOGARITHMIC MODELS

Coefficient of Explanatory Variable \ Explanatory Variable	S_t	S_{t-1}	$\frac{(S_t + S_{t-1})}{2}$	K_{t-1}	P_t	D_t	Dum_t
SL I α_i	+	+	±	±	+	±	±
SL II α_i'			±	±	+	±	±
Ln I β_i	+	+	±	±	+	±	±
Ln II β_i'			±	±	+	±	±

A PRIORI EXPECTED SIGN TABLE OF COEFFICIENTS FOR RATIO MODELS

Coefficient of Explanatory Variable \ Explanatory Variable	$\frac{S_t}{K_t}$	$\frac{S_{t-1}}{K_t}$	$\frac{S_{t-1}}{K_{t-1}}$	$\frac{P_t}{K_t}$	$\frac{R_t}{K_t}$	$\frac{D_t}{K_t}$	Dum_t
Ratio I γ_i	+	±		+	+	±	±
Ratio II γ_i'	+		+	+	+	±	±

A Previous Attempt to Establish an Investment Function

Related to this study is an earlier attempt to estimate an investment demand function for the Philippines is that of Encarnación and Hooley.[6] In an unpublished memorandum, they reported on results obtained for an aggregative function for Philippine manufacturing. They used data from the *Annual Survey of Manufactures*, deriving 75 "industries" by using observations on a 3-digit ~~SITC~~ ISIC level. But after eliminating some industry groups because of absence of certain data, and deleting a few because of extreme observations, 59 industries remained. The attempt was to fit an equation of the type

$$\frac{I_t}{K_{t-1}} = \alpha \frac{I_{t-1}}{K_{t-2}} + \beta \frac{S_{t-1} - S_{t-2}}{S_{t-2}} + \gamma \frac{J_{t-1}}{K_{t-1}} + u_t$$

where: I_t is gross capital expenditures during year t (1960)

K_t is the depreciated book value of fixed assets at the end of period t

S_{t-1} is sales during t-1

J_{t-1} is value added by manufacturing less total payrolls and bonuses paid to employees during t-1

u_t an error term

---

[6] José Encarnación, Jr. and Richard W. Hooley, "Report on a Cross-Section Estimate of a 'Manufacturing Investment Function for the Philippines, 1960'". (Memorandum to the Dean, College of Business Administration, University of the Philippines, September 18, 1963, typewritten, 5 pp.)

This investment equation has close affinity to a study involving New Zealand manufacturing made by A.D. Brownlie.[7]

The formulation represented a compromise on several important points. Because of lack of data, K_t was measured on a depreciated rather on an original cost undepreciated basis, thus allowing differences in age of capital stock and depreciation methods, in addition to asset size, to influence the variation of K among firms. J_{t-1} was taken as a proxy for profits, even though it is known that J_{t-1} is greater than P_{t-1} by the amount of nondirect production costs, which may differ considerably from firm to firm. Finally, as already pointed out, I_t, which is investment outlays, may differ substantially from total investment.[8]

They found a regression fit given below:

$$\frac{I_t}{K_{t-1}} = \underset{(0.135)}{0.595} \frac{I_{t-1}}{K_{t-2}} + \underset{(0.137)}{0.024} \frac{\Delta S_{t-1}}{S_{t-2}} + \underset{(0.030)}{0.099} \frac{J_{t-1}}{K_{t-1}} + u_t$$

with a multiple correlation coefficient of .40. This result is unsatisfactory from a statistical viewpoint. Most

---

[7]"An Econometric Analysis of Investment in New Zealand Manufacturing, 1957-8," *Economic Record*, vol. 38, no. 82 (June, 1962), pp. 157-66.

[8]The reasons for this are covered in the following section on Data.

of the variation in investment is explained by reference to investment in the previous period; the partial correlation of this variable to investment is about the same as the multiple correlation coefficient. The sales coefficient is not significantly different from zero. It is worthy of note, however, that the coefficient measuring the effects of the profits proxy, is significant, even though its contribution to the total explanation is negligible. The same equation was attempted for data from the *Annual Survey of Manufactures* of 1956, but no positive results were obtained. In short, the results of these experiments were, to say the least, disappointing.

We feel that the results of the Encarnación-Hooley fit were prejudiced by poor data. Not one of the variables included in their regression can be measured from the *Survey of Manufactures* data without errors so large as to render the process of fitting of doubtful meaning. [Second, an aggregative investment function is conceptually questionable if different industries have different functions. In other words, it may be necessary to fit such a function on a disaggregated basis if there is reason to believe that different groups of firms exhibit different patterns of investment behavior.]

IV. DATA AND ECONOMIC BACKGROUND

Data

The data used for this study were obtained from the financial reports of 160 manufacturing firms. A random sample of 175 firms was originally chosen, stratified by size of assets and by industry. Of these, fifteen firms had to be eliminated due to lack of data for some of the variables studied. The work of editing these financial records needs to be emphasized because it is so important to the results of the tests made on it, and because there is a tendency sometimes to overlook the importance of this tedious but essential step in any quantitative studies of this type. For each of the 160 firms, the audited financial statement was reconstructed to conform to a special accounting "grid", designed for this study. This amounts to a disassembly of each financial statement and its reassembly into a standardized accounting framework, which insures that a variable is measured in the same way for each firm. Supporting schedules to the accounting statements, footnotes and information received orally are all utilized in reconstructing the financial data.[1] Finally, the data for the income statement and balance sheet are checked for

---

[1]The original records were edited under the direction of H.A. Moreno, as a part of the Flow-of-Funds Project of Professor Hooley at the School of Economics, University of the Philippines.

internal consistency. It is often not fully appreciated that the ordinary accounting statement consists of a set of equations (identities), by means of which a trained accountant can check the consistency of the statements. When an income statement and balance sheet cannot be reconciled, there must be either (1) a misstatement in one of the reports or (2) insufficient detail on some variable. In most cases insufficient detail is the problem, and the process of reconciling the statement thereby proves invaluable in reducing measurement error. We consider this checking of flows against reported stock changes so important that we omitted any firm for which the reconciliation could not be made satisfactorily. It is a tedious but indispensable foundation for useful results.

The measured variables relevant to this study have the following definitions:

Profits - net profits after income taxes

Sales - gross sales less discounts and returns

Capital stock - the total of undepreciated plant and equipment valued at original cost, and excluding intangibles

Depreciation - depreciation accrued during the year estimated on a straight line method

Gross Investment - capital stock at the end of the period less capital stock at the beginning

All of these definitions are self evident with the exception of the last. When computed as a change in capital stock of the firm, the correct definition of gross investment in time period t is:

$$I_t = K_t - (K_t^s + K_t^d) - K_{t-1}$$

where:

- I_t - gross investment
- K_t - undepreciated capital stock at the end of period t
- K_{t-1} - undepreciated capital stock at the end of period t-1
- K_t^s - sales of (used) capital stock during period t
- K_t^d - value of capital stock scrapped during period t

The volume of K_t^s is typically very small in the Philippines. In recent years Census data show it to be about 3 per cent of gross investment expenditures. While no data exists on scrappage of fixed assets, it is only reasonable to assume it has been very small in the postwar period. Due to the destruction of assets during the war, and to the high rates of investment after, about three-fourths of fixed assets in manufacturing have been installed since 1945. Considering also that the actual life of assets is much longer in the Philippines than in developed countries, we feel it is safe to conclude that only an insignificant part of fixed capital is now being scrapped. Hence, it may be assumed that the scrappage rate of zero will not introduce an error large enough to affect the substance of the results.

The firms were divided into five groups by asset size. These are shown below with their corresponding descriptions.

	Asset Size (million pesos)	Per cent Distribution
Very small firms	Less than 1.0	22.9
Small firms	1.0- 2.9	26.5
Medium firms	3.0- 9.9	20.5
Large firms	10.0-15.9	17.5
Very large firms	16.0-and over	12.6
	Total	100.0%

In devising our own size classifications, we are able to distinguish between a greater variety of firms with obviously different structure at least in respect to scale of activities.

By industry, the sample of 160 firms was distributed as follows:

Industry Group (ISIC Code)	Per cent Distribution
Food (20)	12.5
Tobacco and Beverages (21, 22)	7.6
Textiles (23)	6.9
Footwear, Wearing Apparel, etc. (24, 29)	9.8
Wood and Cork Products, Furniture and Fixtures (25, 26)	7.5

Paper Products and Printing (27, 28)	12.6
Rubber, Chemicals, and Petroleum (30, 31, 32)	14.6
Mineral and Basic Metal Products (34, 34)	9.7
Heavier Industries (36, 37, 38)	18.8
Total	100.0%

From the above it is clear that the sample of 160 firms covers a wide spectrum of industries and sizes.

The question may be raised what relationship this data bears to data on investment and sales reported by the Bureau of the Census for various industries.[2] We feel that these data are far superior to the Census data *for the purposes of this study.* There are several reasons for our preference. First, we pointed out previously in our discussion of an earlier attempt of Encarnación and Hooley to fit an investment function, the specification of many variables in the Census leaves much to be desired from the standpoint of this study. Fixed assets are measured at book values, net of depreciation, with no information on depreciation actually accrued. Profits and retained earnings are not measured at all. Lagged values are subject to a large error whenever there is substantial change in the sample of firms included from year-to-year.

[2]Bureau of the Census, *Annual Survey of Manufactures.* Annually, 1956-1961.

This error is particularly serious for industry groups at the two-digit, and more so at the three-digit industry level. Further, no cross-classification by size of firm is possible on the basis of published Census data. Again, the data as reported in the Census are based on the establishment; however, *a priori*, one would expect investment to be a firm-oriented type of behavior. It is agreeable that the investment decision is a phenomenon of the firm, so that investment of each firm is based on its past experience as interpreted by its managers. If this is correct, investment of each establishment is *not* independent and hence the statistical assumptions of the regression fits are not satisfied. It might also be added that it proved very useful to be able to identify the firms composing any group. This enabled us to interpret the results since patterns of behavior emerged for certain classifications of firms (e.g., by form of ownership) which were not suggested by existing theories of investment behavior. Finally, the Census data record investment *expenditures*. Not all investment need be included under this term, since in this country a substantial volume of investment is pursued as own construction. This seems to be the reason for the low correlation between investment expenditures and changes in fixed assets as recorded in the Survey of Manufactures, as shown in the accompanying chart. Thus a substantial error exists when investment is measured as investment expenditures. There is reason to believe that this error is non-randomly distributed by size of firm and among firms by industry group.

Economic Background of the Period.

The statistical data used in this study refer to the years 1961 and 1962. Most of the data refer to 1962; the year 1961 is only relevant for the lagged values (t-1). The year 1962 was characterized by free convertibility of foreign exchange for both goods and capital. However, this followed a long period of exchange and import controls. Since almost all machinery and equipment and some inputs for factory construction are imported, it is important to present a thumbnail sketch of the domestic economy in the Philippines as it emerged from the period of controls.

Import and exchange controls were first adopted in the Philippines in 1949. In the years immediately following World War II the country experienced a continuous deficit in the balance of trade which was reflected in a steady decline in the country's foreign exchange position. The object of controls, when they were first imposed, was simply to bring the external accounts into balance. By 1953 this objective had been accomplished. At the same time, domestic investment had declined substantially from its peak of 1951, and the growth of output likewise declined.

In 1954 official policy with regard to exchange controls shifted. Whereas previously the primary aim was external balance, a second objective was now added: the stimulation of domestic investment. These two were received as complementary so long as increases in domestic production were concentrated in import substituting goods. Import quotas for the purchase of machinery and equipment were given top priority, and licenses to purchase foreign exchange were made available at the official exchange rate.

Investment was also stimulated through an easy money policy. Between 1955 and 1959 money supply increased by 38 per cent whereas real GNP advanced by only 20 per cent. Only part of this disparity was reflected in increases in domestic prices: the general wholesale price index of domestically produced products rose 10 per cent during the same period.[3] Another part of domestic demand flowed over into imports. Part of these additional imports were consumer goods, but a large part were partially fabricated goods required for

---

[3]Central Bank of the Philippines, *Statistical Bulletin*, December, 1965.

inventory investment, the demand for which had apparently been badly underestimated by those in charge of granting import licenses. The net result of the easy monetary policy was, therefore, to reinforce strongly the demand for investment by raising total aggregate demand. By the late 'fifties aggregate demand was pressing on supply in all areas -- domestic consumption and investment, but also, unfortunately, on the import side as well. Foreign exchange reserves, which were $154 million in 1954 declined to a low of $89 million in 1959.

The monetary expansion of the 'fifties left liquidity at high levels throughout the economy. Commercial banks, for example, raised their excess reserves from ₱54 million in 1955 to ₱155 million by the end of 1958. Liquidity was also high among business concerns at this time and -- perhaps of paramount importance -- among consumers as well. Unfortunately, we do not have any reliable series on consumer liquidity for this country. But there are important pieces of evidence which suggest that consumer liquidity reached its peak in 1958 or 1959. For example, yields on industrial shares traded on the Manila Stock Exchange reached their post-war peak in the first quarter of 1959.

A third tool used to raise the level of domestic investment was tax exemption. As early as 1946, a law exempting from internal revenue taxes of "new and necessary" industries was in operation. But only with the grant of more liberal tax concessions in 1953 and with the policy climate for conscious import substitution after 1953 that the response to this law became very widely felt. The 1953 law exempted any firm undertaking "new and necessary industries" from the payment of "all" taxes up to 1958. A four year transition from 1959 to 1962 in the form of gradual yearly reductions in the proportion of tax exemption was provided before full tax coverage in 1963 was to be effective. After 1953 there was an onrush of applications for tax-exemption and by 1957, about 772 product lines had been reported as having been granted tax-exemptions. In a subsequent part of this paper we shall return to the new and necessary industries and the impact of tax exemption on their investment demand.

(*) The success of these policy tools taken as a group, on raising the level of domestic investment and production cannot be doubted. Between 1955 and 1959 manufacturing output grew at an annual average rate of 14 per cent, and the share of national income originating in manufacturing rose from 10 to 16 per cent.[4] The expansion of output was accompanied by a sharp increase in the number of firms engaged in production.

Many firms converted from simple commercial operations, revolving around import-export trade, to fabricating.[5] This meant that they brought with them into their manufacturing operations a good knowledge of the market for their products, and a relatively sophisticated approach to business organization and decisions.

In spite of the achievement of the period of controls in raising investment, it was possible to obtain agreement from all sections of society to bring it to an end. Consumers looked toward an increased supply of goods at admittedly higher prices, and preferred that to a situation of very limited goods supply at lower prices. Many businessmen looked upon controls as a barrier to increasing investment because of the swollen, unsatisfied consumer demand. Everyone understood that the real meaning of foreign exchange control was greatly attenuated when a growing portion of foreign exchange earnings was not being channeled to the Central Bank in any event.

In the second half of 1959, Congress passed legislation providing for the gradual removal of exchange and import

---

[5]For example, textiles. Most new textile mills are operated by individuals with previous experience in the textile import business.

controls. Most investment goods were placed on the free import list in the second quarter of 1960.[6] That meant that machinery and other factory equipment could be purchased from abroad in any amount, at the rate of ₱3.20 to US $1.00. Later the rate was stabilized at ₱3.90 to US $1.00. In the first quarter of 1962[7] all goods were put on a free import basis, at the stabilized exchange rate. Thus, while import and exchange restrictions were removed on consumption goods in 1962, investment goods were virtually unrestricted since the first quarter of 1960. This is important, because it means that our study of investment demand pertains to behavior under condition of free entry of investment goods. Consumer goods, on the other hand, had free entry during 1962 (our t period) but restricted entry during 1961 (our t-1 period).

The purpose of the above sketch of economic conditions immediately preceeding decontrol has been to bring out the important forces bearing on business investment decisions in 1961 and 1962. First, there existed high level of consumer demand pressing on the existing supply of goods. Both money

---

[6]See Central Bank Circular No. 105, April 25, 1960.

[7]See Central Bank Circular No. 133, January 21, 1962.

income and consumer liquidity were at record levels.[8] Second, investment decisions were subject to firm behavior entirely, since investment goods were available in unlimited supply at the higher, stabilized exchange rate after 1960. Third, expected profits were lower for 1962 than in previous years, although the decline should have been at least partly offset for some firms as a result of a fuller utilization of capacity. Finally, there was a complex effect of tax exemption, operating on selected firms in specified industries, the net upshot of which is unclear at this point.

---

[6]The consumer goods marked was "reserved" for domestic manufactures virtually uninterruptedly through 1962: because consumer goods were under import controls through the first quarter of 1962, and order and shipment lags would insure that this would convey protection throughout most of the balance of the year.

V. INVESTMENT DEMAND IN PHILIPPINE MANUFACTURING: PRELIMINARY

In the following the regressions of the data according to the different models discussed previously are reported, and the results analyzed. For each model we report three regressions. "Pooled regressions" refer to regression fits for all firms. Regressions by asset size are also presented, showing the results obtained when the models are fitted to the data after they have first been classified according to firm size. Finally, regressions are fitted after the firms are classified by industry group.

In the appendix we report the results of those regressions which we consider to give the most useful results from among a much greater variety of steps which were initially reported by the computer. There are cases where estimates of coefficients are included in spite of the fact that they are not significant. This is done when we think that inclusion of these variables sheds light on their role as explanatory variables in investment behavior.

Regression results for the simple linear (SL) model are shown in Appendix Table IA. In models SL I (IV) and SL

II (VI), sales lagged one period is significant and the sign is positive as expected. Apparently sales of the current period merely contributes to the effectiveness of lagged sales, and therefore it may be dismissed as an explanatory variable in its own right. Sales averaged over two periods $(S_t + S_{t-1}/2)$ is introduced in the last regression, but is not significant. Capital stock lagged one period (K_{t-1}) is introduced in SL II (III) and SL II (VI), and is negative in both cases but not significant. This variable does not, therefore, appear to be an important explanation of investment behavior.

Easily the most impressive explanatory variable in the simple linear regression is profits. P_t takes a positive sign and is highly significant in all regressions without exception. Moreover, in SL II (III), when it is the only explanatory variable, aside from K_{t-1} (which is not significant), the coefficient of correlation is almost as high as in the other formulations. For this reason, we conclude that most of the explanatory power of these linear type regressions can be attributed to profits. Neither depreciation (D_t) nor tax exemption (Dum_t) appear to exert any influence on investment in this model.

The results of pooled regressions for a logarithmic investment model are shown in Appendix Table IB. Once again we have sales showing up significant in the first two formulations (Ln I (IV) and Ln I (VI)) while two period averaged sales is not significant, as shown in Ln II (VI). In contrast to the simple linear formulation, however, it is current period sales which take on the positive sign while sales lagged one period takes on a negative sign. There is no *a priori* reason, of course, why the rate of investment in the current period cannot be related to the rate of sales in the current period; while the volume of investment in the current period is related to the volume of sales in the previous period. However, considering the collinearity that necessarily exists in our pooled data, we are inclined to believe that this reversal of signs of the sales variable which is obtained when transforming the function into logarithmic, reflects an aggregation problem inherent in the pooled data. The change in signs may be due to the fact that the cross section data, taken in unstratified form, contain certain extreme pairs of values of sales and investment, for certain classes of firms, which the logarithmic fit can "leap over" effectively, in contrast to the simple linear fit. If this is the case, then we can postulate that on the basis of the results for these two fits, there may be some types of firms for which current period sales is the best of the sales explanatory variables; and there are other classes of firms for which sales lagged over period is the best of the sales explanatory variables.

K_{t-1} turns out to be significant in the last two fits with positive coefficients. This suggests that the log transformation is more effective in dealing with extreme values in the case of this variable also. Again we note that profit is positive and very highly significant statistically in all equations without exception. The logarithmic transformations improve the fits.

The results of pooled regressions for a ratio investment model are shown in Appendix Table IC. These regressions are especially important in checking conclusions drawn from the previous fits. Once again, sales appear unmistakably as a significant explanatory variable. In the first two equations S_t/K_t takes a positive sign and is statistically significant. In the last two fits, S_{t-1}/K_{t-1} is positive and significant.

Then S_t/K_t becomes negative. We speculate that lagged sales is on the whole a more powerful explanatory variable, but that there is some relationship between investment and current period sales, probably for a sub-class of firms.

Profit does not appear as an important explanatory variable in the second and third ratio fits (Ratio I (VII) and II (V)). However, retained earnings do appear as significant with a positive sign in the last regression (Ratio II (VII)). This is the best fit.

Summary for pooled regressions: - The conclusion to be drawn from this evidence as a whole is that the pooled regressions do point to the existence of a number of important relationships between investment and other explanatory variables. On the basis of these fits manufacturing investment displays a strong profits-push type of behavior. Profits is highly significant in all eight regressions for linear and logarithmic fits. In the ratio regressions retained earnings is significant at the 0.05 level. Thus, out of a total of 10 fits for three different types of functions, the relationship between profits (or retained earnings) and investment is positive and significant at the 0.05 level nine times.[1]

Generally, when profits is significant, depreciation is not significant, and vice-versa. This reflects a strong profits-push type of investment behavior, among firms where the practice of replacing machinery and equipment on a steady, conventional basis has not yet exerted a strong grip on investment behavior of firms in general. Of course, one would expect this inference to be modified as one moved among firms of different classifications -- and this is in fact done in later sections of this paper.

A number of sales variables are tested. In every test of sales or sales lagged one period -- i.e., in eight out of eight regressions -- one or the other of these variables was positive and significant at the 0.05 level. On the other hand, the two-period sales averaged $[(S_t + S_{t-1})/2]$ was never significant. There is ample evidence therefore, that sales affects investment decision. However, while significant, sales does not seem to explain as much of investment behavior as profits. In all the fits, at least half -- and generally much more than half -- of explained

---

[1]It will be recalled that this type of relationship was suggested earlier by the Encarnación and Hooley study.

variance is traceable to profits or retained earnings rather than to sales-pull.

It is interesting that the dummy variable expressing tax exemption did not show up as significant. Its sign was positive in 5 out of 7 cases. In general, it is concluded from this evidence that tax exemption had no apparent effect on investment behavior. This conclusion is, however, very tentative, since of all variables tested, the one that one would expect to be very sensitive to industry groupings is precisely this one. Further testing of the inference later in this study is therefore in order.

In conclusion, we do not feel that a pooled regression is the best method of analyzing investment demand. At best the results can be suggestive of the role of some of the more important explanatory variables. It remains for us to examine other disaggregations of the data in order to yield additional meaningful results.

VI. INVESTMENT DEMAND BY FIRM SIZES

When the sample is stratified by size of firm,[1] the observable characteristics are limited to firms in each classification -- i.e., observations are made with the effects of firm size held constant. Regressions by asset size have theoretical value, because analysis of the results of such fits enables one to contrast the behavior of small against that of large firms. Although size does not enter explicitly as a determinant of firm behavior in much of traditional theory of the firm, this is more because of the relatively underdeveloped state of this branch of theory. However, there are plenty of suggestions in the literature to the effect that large, generally older and larger, firms take on different behavior patterns than their newer and usually smaller, rivals. More recent developments in the theory of

---

[1]Here, as elsewhere in this paper, we define firm size in terms of assets. This is, of course, somewhat arbitrary since we could have measured size on the basis of a large number of other variables -- e.g., sales. However, choice of the criterion of size will not affect the results as long as one adheres to one of the more important variables. We think total assets is as good -- and as stable -- an indicator as any of the alternatives.

the firm explicitly suggest that behavior patterns of publicly traded (larger) firms, in the sense of being openly held, are *essentially* different from those of privately held (smaller) enterprises.[2] The argument is based on the proposition that the decision-making machinery is essentially different in the two types of firm.

Regressions of firms classified by asset size are also useful as a means of dealing with multicollinearity which results from variation in size of firms. For example, suppose we are considering the hypothesis that sales and investment are related in a simple accelerator model without any time lags. Suppose further that we have data on two firms (say A and B), where firm B is twice the size of A, as shown below:

	Firm A	Firm B
Investment	10	20
Sales	40	80

If a regression analysis is made on these two firms, it will

---

[2]See below, p. 58ff., for a development of this point.

be found that investment and sales are related, and the slope of the equation will measure the apparent relationship. However, it is clear that these variables are intercorrelated due to a scale factor. If the scale factor is removed the correlation will also be removed. One way to take care of this is to regress firms of the same size. Of course it is not practicable to obtain firms of identical sizes. However, essentially the same result can be achieved by grouping together firms of approximately the same size.

Regression fits for firms by asset size are shown in Tables 2A, 2B, and 2C of the Appendix Table 2A, showing the coefficients for the simple linear fit, contains some interesting results. On the one hand, the profit variable is highly significant for the two smallest size classes. As one descends the order of size, the t-values of the profit variable continuously decline and take on the wrong sign, until one reaches the last, and largest size class, where it once more becomes positive and significant. However, there is a special reason for significance of the profit coefficient in this last class which is not directly connected with firm size, but with cross-classification on another variable.[3] In general, therefore, small firms show strong profits-push behavior of a linear type. What is especially noteworthy is that the fits have been improved for small firms after removing collinearity due to size. On the other hand, no one of the sales variables is positive and significant for the sample of firms when classified by size. Finally, the dummy variable, which was uniformly non-significant when applied to pooled data, is negative and significant for small firms at the 0.05 level. For the larger firms, however, it is not significant one out of 5 times; and it has a positive sign for the one case in which it was significant. The general inference consistent with these results is that tax exemption was not a significant factor in the investment demand behavior of the firms considered at least during the period under study.

Logarithmic regressions by firm size, are shown in Appendix Table 2B. In general, these fits are poorer than the simple linear fits; they are also poorer than the pooled log fits. This fact supports our earlier fear that the good

---

[3]This will be discussed at length, later, when investment behavior of foreign subsidiaries is taken up.

showing of the log fits compared to other pooled fits is based on the ability of the log fits to "leap over" extreme values. It is useful to notice also that these log fits run on firms arranged by size tend to give slightly better results for sales (2 out of 12 sales variables on positive and significant) and the profit variable is not so strong in the small size class. The dummy variable also is generally not significant.

Regression runs using a ratio model are shown in Appendix Table 2C. Here, as elsewhere, there is improvement of the fit through disaggregation, not for all classes, but particularly for size classes 13- and 15-17. In all the ratio fits the sales coefficients are substantially improved. Some highly significant coefficients appear, especially for S_{t-1}/K_{t-1} in the largest (15-17) size group. No sales coefficients are significant, however, for the smallest size group.

In general, the ratio model does not offer particularly interesting results for the investment function when firms are disaggregated by size. With a few exceptions, the fits are not encouraging, and variables do not improve their t-values. However, it ought to be observed that the variable measuring the rate of sales in the previous period (S_{t-1}/K_{t-1}) shows a definite improvement with this formulation. In discriminating in favor of this statement of sales, the results lead one to the conclusion that the rate of investment defined as I_t/K_t is significantly related to the sales of the previous period as a ratio to the capital stock of that period.

In terms of size-class regressions, the simple linear model appears to be among the most useful. For small firms (under ₱3 million assets) it is the best fit; for the smallest size firms (under ₱1 million assets) it is the only fit which produces useful results. An encouraging feature about the linear regression on small firms is that the fits are substantial improvements over the linear pooled regressions presented earlier.

Linear regressions on small sized firms all reflect the importance of profits as a determinant of investment, while lagged sales or average of two period sales, are never positive and significant. These findings suggest that small firms have an investment horizon which is dominated by funds available to the firm from current operations. The dummy variable generally appeared as negative and significant. Apparently, tax exemption privileges, if they are to be effective at all may be expected to work through profits in an important degree. When investment is subject to as strong a profit-push as it apparently is for these firms, the effectiveness of tax exemption on investment is likely to be particularly strong.

As one moves to larger size firms, the importance of profits diminishes, and along with this the role of the dummy variable. However, depreciation becomes more prominent as firm size increases. This suggests that among larger firms investment is more geared to rational replacement of used capital, on the basis of conventional measures of accounting. Either small firms are not able to utilize modern accounting methods in estimating depreciation on their capital stock, or, for some reason, they prefer to ignore them because they do not depreciate fixed assets because they operate on a cash basis.

Logarithmic regressions by size of firm do not add much to what we learn from the linear regressions. On the whole the fits are not quite as good for these regressions when compared to logarithmic regressions using pooled data. This tends to confirm our earlier misgivings about the log regressions on pooled data: that the relative goodness of fit there was due in part to the ability of the log transformations to "leap over" extreme values. However, many of the basic patterns of behavior which are evident in the linear regressions appear again in the log transformations.

In general, the role of profits is less and that of sales slightly greater. Depreciation plays a more important role throughout. Fits for small firms, using logarithmic models are definitely poorer than those obtained with untransformed data. On the contrary, fits for large size firms are sometimes improved when R is used as a criterion of goodness of fit.

A striking feature of the ratio fits is the performance of the sales variable. The most promising of these variables, S_{t-1}/K_{t-1}, is significant at the 0.05 level three out of five times; and for larger firms (over ₱1 million pesos assets), *three out of four times. At least one of* the sales variables is significant at the .01 level for each asset class except the smallest. In general, ratio fits for larger firms are somewhat better than those for smaller firms. Indeed, the ratio fits for the smallest firms are among the poorest of all. A tentative inference that we can make from this evidence is that for larger firms a sales-pull is much more in evidence than in the case of small firms. The relationship that is most promising is not between the absolute level of sales and investment, but between the rate of investment on the one hand and the rate of sales growth (preferably lagged one period) on the other. This interpretation would be consistent with the findings from both the ratio and logarithmic regressions, as well as with the results obtained for large firms from the simple linear fits. If this interpretation is correct, it suggests that large firms display different investment behavior than small firms.

The last inference seems important to us and we decided to check it with a rerun of our data using a slightly different approach. All firms were divided into two major classes: large (firms with at least ₱6 million in assets) and small (firms with less than ₱6 million). We then fitted the following regression:

$$\frac{I_{it}}{K_{it-1}} = \beta_0 + \beta_1 \frac{I_{it-1}}{K_{it-2}} + \beta_2 \frac{S_{it-1} - S_{it-2}}{S_{it-2}} + \beta_3 \frac{P_{it-1}}{K_{it-2}} + \beta_4 \frac{R_{it-1}}{K_{it-2}} + u_{it},$$

where β_i $(i = 0, 1, \ldots, 4)$ are the regression coefficients and the other symbols are defined elsewhere above. These regressions differ from the ratio regressions performed earlier in that the specification of the investment equation is similar to the Encarnación-Hooley equation.[2]

[2]See above, p. 27.

The results are as follows:

<u>Large firms</u>:

$$\frac{I_{it}}{K_{it-1}} = \underset{(4.783)}{-0.689} + \underset{(0.170)}{0.357}\ \frac{I_{it-1}}{K_{it-2}} + \underset{(0.063)}{0.115}\ \frac{\Delta S_{it-1}}{S_{it-2}}$$

$$+ \underset{(0.125)}{0.165}\ \frac{P_{it-1}}{K_{it-2}} + \underset{(0.139)}{0.083}\ \frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.50$

<u>Small firms</u>:

$$\frac{I_{it}}{K_{it-1}} = \underset{(4.701)}{6.646} + \underset{(0.057)}{0.170}\ \frac{I_{it-1}}{K_{it-2}} + \underset{(0.030)}{0.004}\ \frac{\Delta S_{it-1}}{S_{it-2}}$$

$$- \underset{(0.106)}{0.114}\ \frac{P_{it-1}}{K_{it-2}} + \underset{(0.143)}{0.450}\ \frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.51$

Large firms exhibited more sales-pull behavior, while small firms showed more profitability behavior via the mechanism of retained profits. This confirms our earlier inferences, on the basis of more scattered evidence, of a basic difference in the investment behavior between small and large firms.

<u>Implication for the Theory of the Growth of the Firm: Family Firms and Publicly Held Firms</u>

Why do small and large firms display different investment behavior? More specifically, why do small firms gear investment

closely to profits while large firms gear it more to sales?
One possible explanation is that small firms, because of their size find that the only important source of funds available to them is earnings. This would be the case if the financial system exhibits a size-bias in its allocation of funds. Such a bias might be reflected in higher charges for capital supplied to small firms; it might also be exercised in terms of reduced availability of credit.

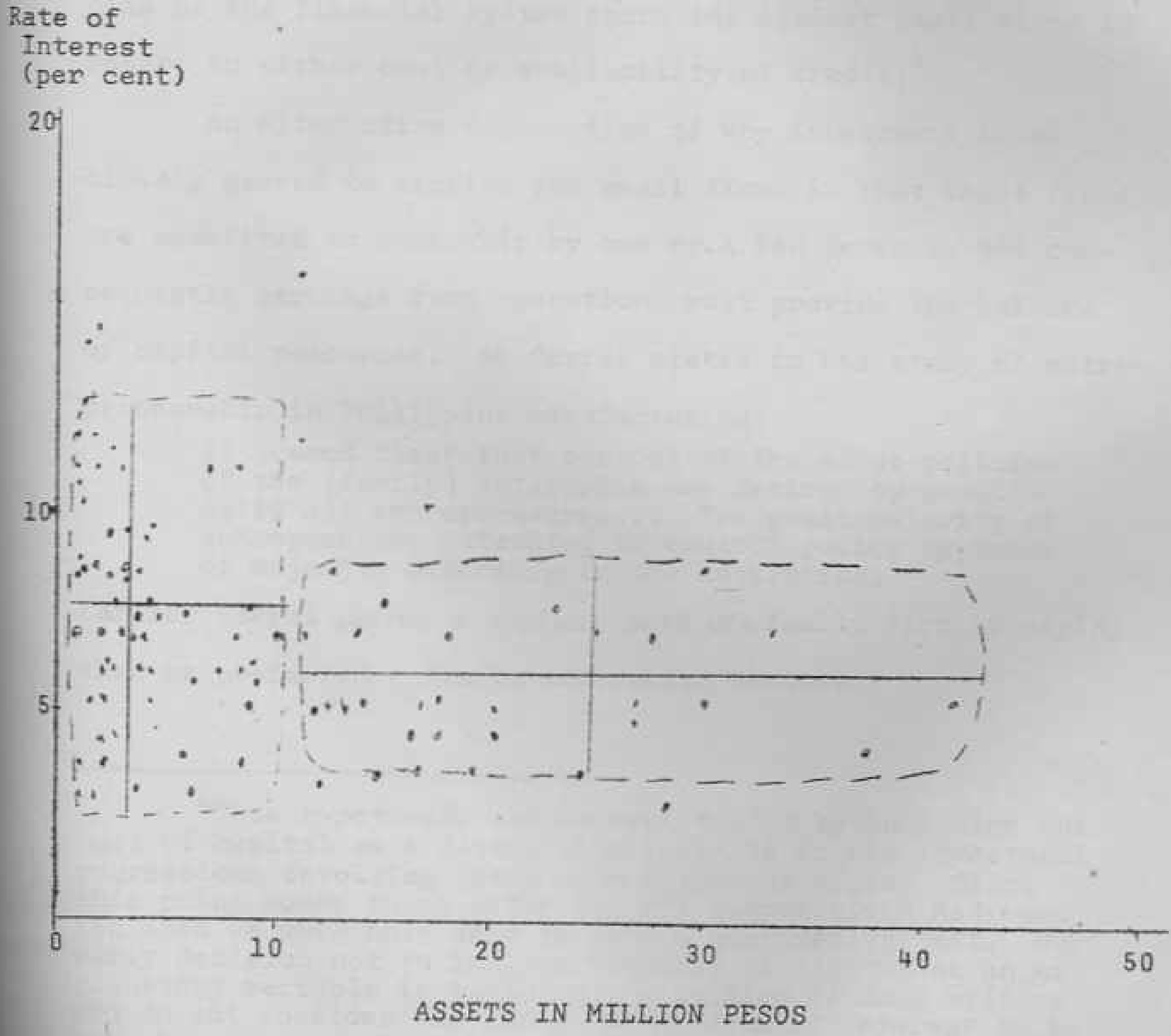
To test the hypothesis that interest charges for small firms are higher than for large firms we selected a random sample of 100 manufacturing firms, and computed the effective date of interest on bank borrowings[3] for each company. These data, when plotted against size of assets, produce the scatter diagram shown below.

These data indicate that there were many small firms which received accommodations at commercial banks at interest rates as low as, and sometimes lower than, the average rate paid by large firms. To be sure, there were some small firms which paid relatively high rates for their funds; and in general, the average rate paid by firms with less than 20 million pesos was above the average rate paid by firm with assets in excess of that amount. In general, however, there appear to be a strong basis for arguing that small firms consistently pay substantially higher charges for services than large firms.

---

[3]This is approximated by interest paid during the year divided by bank loans outstanding at end of year.

EFFECTIVE BANK RATES OF INTEREST
PAID BY FIRMS, 1961



Out of the 100 firms sampled, 95 received accommodation at banks during the year 1961. Thus the overwhelming majority of firms, both large and small, were served by the most important branch of the financial system. On this evidence, then, one is inclined to conclude that at least there was no strong bias of the financial system operating against small firms in regard to either cost or availability of credit.[4]

An alternative explanation of why investment is so closely geared to profits for small firms is that these firms are committed to ownership by one or a few persons, and consequently earnings from operations must provide the balance of capital resources. As Carrol states in his study of entrepreneurship in Philippine manufacturing:

> It seemed clear that control of the major policies of the [family] enterprise was desired by practically all entrepreneurs.... The great majority of entrepreneurs attempted to control policy by means of majority ownership in the enterprise.[5]

Earlier Carrol quotes a typical head of a family firm as saying that he preferred a family enterprise because

---

[4]This hypothesis can be best tested by including the cost of capital as a determining variable in the investment regressions involving firms with different sizes. Since this point comes to us after all the computations had been finished we were only able to make a qualitative test. Our early decision not to include the cost of capital as an explanatory variable is based on the opinion of many writers who do not consider the influence of rate of interest to be very important at least in the investment decision. If this is so in developed economies, we thought that it is an even more likely state of affairs in underdeveloped countries with correspondingly underdeveloped financial systems.

[5]John J. Carrol, *The Filipino Manufacturing Entrepreneur* (Ithaca: Cornell University Press, 1965), p. 159.

"outside stockholders tend to interfere in management.... and are constantly demanding dividends rather than allowing profits to be reinvested.[5]

An enterprise that is committed to ownership as a major goal of business policy is a special type of business institution with unique constraints on investment decisions. It may obtain some outside capital from banks or relatives, but its primary source of funds will necessarily be earnings. As there are no outside stockholders, dividends can be passed, making earnings that much more important as a source of finance. Ownership as a reward of business behavior is itself a goal that brings with it a whole set of organizational, managerial and financial behavioral characteristics.

The corporation whose stock is publicly held does not have the same structure of goals as the family corporation. Almost invariably, the publicly-held corporation is large, often among the largest manufacturing firms. It is not committed to complete ownership as a goal. Large publicly held firms, in this country as in others, are generally controlled by a group who owns only a small fraction of all outstanding shares. In its goal structure it has room for growth as a primary objective. Earnings need not be sole or most important source of finance because public distribution of equity

---

[5] *Ibid.* p. 119.

is an alternative source of capital. The importance of operating earnings as a source of finance is further attenuated by virtue of the necessity of regular dividend payments, a policy made necessary by the broadened base of share ownership. The large publicly held firm therefore shifts to a form of behavior where the overriding objective of profits either is reduced or is replaced by a set of more important objectives. Baumol[6] has even suggested, apparently in the context of oligopolistic firm behavior, that sale maximization subject to a minimum profits constraint appears to be a more realistic hypothesis. We suggest that for larger firms in general the growth of sales appears as a high, if not first priority, objective. This is compatible with the goals of modern management, which stresses sales growth as a criterion of success, in contrast to the small family owned enterprise in which ownership and complete control are given top priority in policy determination.

We suggest that in the life of most truly successful firms, the time comes when the firm has the opportunity to

---

[6]William J. Baumol, *Business Behavior, Value and Growth* (New York, The Macmillan Co., 1959), chapter 6.

"go public"; and that in this choice (or its rejection), are implied two differing modes of organization and behavior. Different behavior because the structure of goals for each type of firm are fundamentally in conflict. In considering the transition from small or "family" to "large" firm behavior, we find it useful to consider the firms' utility function as one of a lexicographic ordering form, such as has been suggested by Encarnación.[7] When a firm decides to shift from a family enterprise to a publicly-owned one, it drops the utility function of the first and assumes that of the second.

Our findings bear some similarity to those of Kmenta and Williamson.[8] In a study of investment demand function for U.S. railroads based on time series data they found that different patterns of investment behavior were displayed at different phases in the industry's life cycle. It appears that a lagged stock variable was most significant in the periods of adolescence and maturity, while retained earnings became the most important explanatory variable in the final stage of sinility. Assuming some correspondence between the

---

[7] J. Encarnación, Jr., "Constraints and the Firm's Utility Function," *Review of Economic Studies*, vol. XXXI, No. 2.

[8] J. Kmenta and J. Williamson, "Determinants of Investment Behavior: United States Railroads, 1872-1941," *Review of Economics and Statistics*, May 1966.

"life cycle" of an industry and the "life cycle" of a firm, our findings of the changing role of the lagged stock variable and internal financing for the individual firm might also be expected to show up in industry analyses as well. It seems plausible that internal financing is likely to be most important in the initial and final stages of a firm's life.

VII. INVESTMENT DEMAND BY INDUSTRY GROUPS

Classification by size of firm has obvious limitations because the same size group there may represent a variety of industries, thus creating heterogeneity which may obscure behavior patterns. Product homogeneity does not necessarily imply investment demand homogeneity. However, since the members of each industry are faced with similar markets to which they are supplying similar and perhaps competitive outputs, with technologies and factor proportions probably similar also, there is reason to investigate investment behavior by industry groups.

For economic reasons, we decided to regress firms by industry. In order to increase the degrees of freedom, we combined some industries into larger industry groups. For example, beverages and tobacco were combined into one industry group. The combinations were made only among similar products -- i.e.,products serving similar or closely related markets and involving similar production conditions. In this way the number of industry groups was reduced to eleven, and the number of observations in any one group was held to a statistically workable minimum.

The results of regressions by industry groups are shown in Appendix Tables 3A, 3B, and 3C. Table 3A shows the linear regressions by industry group; Table 3B the logarithmic regressions and Table 3C the ratio regressions. Before discussing the results in general, it will be useful to review the results of all three models for each industry group separately.

Tobacco and Beverages. The fits are significant for linear regressions and regressions on data transformed into logarithms. In most of the fits a strong profits-push type of investment behavior is evident, and K_{t-1} also is highly significant. The ratio regressions yield inferior results. In general, little sales-pull effect is evident. When depreciation is entered (Table 3A) it is highly significant, and competes with profit as the primary determinant of investment. The majority of the firms in this group are tobacco firms, a number of which were founded prewar. Demand for this product has grown steadily but slowly over the years. Relying on internal financing perhaps, these firms have been able to expand operations fast enough to keep with growth of demand. It is well known that exports of Philippine tobacco products has grown at surprisingly low rates in recent years. And the income elasticity of demand for this product is known to be low, so that the growth of domestic market is likely to be rapid. Under these circumstances it is not surprising that reasonably mature firms should link their investment outlays pretty close to internal fund sources -- i.e., to profits and depreciation.

Textiles. Three variables are important in textile investment behavior: retained earnings, sales and tax exemptions. Profits are important in the linear regressions, although even these sales and depreciation are obviously of considerable weight, especially in the best fit. This is equally true of the log regressions (note especially Ln I (VI), R = .89). The ratio fits for textiles are good (especially Ratio II (VI), R = .94) and in these fits the impact of sales lagged one period (S_{t-1}/K_{t-1}) is very evident. The dummy variable is often negative, and sometimes significant at the 0.05 level.

Textile firms are medium-large by our classification, and many of these firms were created by the governments policies in the 'fifties. The high rates of taxation of imported textile goods created a rapidly expanding market (i.e., import-substitute market) for the output of these new firms, and this exerted a pull on investment, as can be seen from the significant sales coefficients in some regresssions, especially the ratio models. However, the abnormally large profits conferred on these entrepreneurs enabled them to gear investment fairly closely to earnings.

It is possible to demonstrate the effect of depreciation and the dummy variable in textile investment by use of the Ln II regressions. The regression estimate, without these two explanatory variables is given by

$$\ln I_{it} = \underset{(7.259)}{10.639} - \underset{12.048}{1.666} \ln [(S_{it} + S_{it-1})/2]$$

$$- \underset{(1.037)}{0.128} \ln K_{it-1} + \underset{(1.031)}{1.749} \ln P_{it} + u_{it}$$

$$R = 0.693$$

When depreciation is introduced, the regression equation becomes

$$\ln I_{it} = \underset{(10.151)}{10.612} - \underset{(2.481)}{1.617} \ln [(S_t + S_{t-1})/2] + \underset{(1.990)}{0.204} \ln K_{it}$$

$$+ \underset{(1.520)}{1.702} \ln P_{it} + \underset{(2.176)}{0.100} \ln D_{it} + u_{it}$$

$$R = .6932$$

When the dummy variable is included, the new equation is

$$\ln I_{it} = \underset{(9.017)}{10.190} - \underset{(2.483)}{3.371} \ln [(S_t + S_{t-1})/2] + \underset{(1.877)}{0.768} \ln K_{it-1}$$

$$+ \underset{(1.468)}{2.588} \ln P_{it} + \underset{(1.992)}{0.843} \ln D_{it} - \underset{(2.260)}{3.453} Dum_{it} + u_{it}$$

$$R = 0.830$$

This shows that introduction of depreciation added little to the explained variance of investment. It did, however, help to reduce the influence of profits somewhat. But with introduction of the tax exemption variable, a noticeable improvement is observable in the profit variable, and also in the sales variable. In fact, the whole fit, as reflected in the increase in R from .69 to .83, is definitely improved.

Paper Products, Printing, etc. This industry group consists of firms engaged in the manufacture and distribution of paper and paper products. Most of the firms are large in terms of asset size, and they are about evenly divided between firms which existed pre-war and a group of new ones that was established during the 'fifties. Fixed investment is usually in relatively complex machinery and installation is usually expensive and time consuming.

The best fit for paper is a ratio model (Ratio II (V)) where sales lagged by one period is highly significant and where profit is also significant. The dummy is negative but not significant. The simple linear fit is also quite satisfactory (SL II (V)), with R = .88. In this equation profits is highly significant and depreciation is negative and significant. Note that K_{t-1} is also significant. In general, these results conform with the character of the industry. Firms are usually large, and a number are publicly-owned. The sales-pull simply reflects their growth-orientation, while the importance of profits is probably a reflection of dependence on retained earnings as a major source of funds for financing on the part of a large number of firms in the industry, especially the older ones engaged in publishing.

Food. Reasonably satisfactory fits were obtained for this industry with all three models. Noticeably weak coefficients were obtained for profit however, even in the linear model. Depreciation appeared as positive and significant in the linear and in one equation in the logarithmic model. The sales coefficients show us as significant only in the ratio model. Again thru the relevant variable in sales lagged one period (Ratio II (VII)) the relatively poor showing of profit, and the more pronounced role of depreciation are reflective of the behavior of sugar centrals, which constitute an important segment of food manufacturing in this country. The investment behavior of this industry is largely determined by the situation with respect to the sugar quota in the United States.

For about thirty years prior to 1962, the allowable exports of Philippine sugar to the United States were approximately unchanged at 900,000 tons. Consequently reinvestment ratios were among the lowest in this country.[1] Of course, investment was required to replace worn out equipment, and this accounts for the reasonably good showing for the depreciation variable. K_{t-1} has a significant negative coefficient and satisfies our expectation from the capital stock adjustment principle. This could also be explained by the presence of "growth firms" in the food industry which were non-sugar firms.

What profits-push and sales-pull we observe in food are due largely to the non-sugar producers of manufactured food. There may also be some effect registered in the temporary increase in the sugar quota, which first appeared in 1961. If future regressions are run on food firms, it would be preferable to run separate regressions for sugar and non-sugar producers.

---

[1]That is, the ratio of retained earnings to total earnings was the lowest for a variety of industry groups. On this point see R. Hooley, *Saving in the Philippines 1951-1960* (Institute of Economic Development and Research, Quezon City, 1963), p. 94, Table C-10.

Footwear, Wearing Apparel and Leather Products. The regressions for this industry group are somewhat unusual. Out of six regression runs for this industry, three contain profit coefficients not significantly different from zero, and three have coefficients which are negative and significant. This violates our table of expected signs, and one is tempted to dismiss the results as a poor fit. However, the negative coefficients are significant and we suggest that the results have some meaning. Notice also that depreciation is always positive and often significant. Finally, the sales coefficients take on negative signs fairly often; this is especially true of S_{t-1} which is negative throughout the first two models.

A large part of the explanation of these results is the unusual behavior of output in recent years. This is reflected in the Central Bank data, as shown below.

Indexes of Output of Footwear, Wearing Apparel and Leather Products Compared to all Manufacturing
1960-1962

Year	All Manufacturing	Footwear	Wearing Apparel	Leather Products
1960	100.0	100.0	100.0	100.0
1961	106.6	89.9	90.5	97.9
1962	112.8	79.4	81.5	95.3

Source: Central Bank of the Philippines, *Statistical Bulletin*, December 1965, Table 93.

Between 1961 and 1962 output of footwear and wearing apparel groups fell by about 10 per cent. Leather products showed only a small decline, and the output of all manufacturing rose by about 6 per cent.

We do not say that output of footwear, wearing apparel and leather industries fell, because the Central Bank index is based on a *fixed* sample of reporting firms. What we say is that the output of individual firms on the average declined. We suggest that these industries are characterized by ease of entry, low capital-labor ratios, fairly simple technology and therefore optimum size of firms is also probably small. Our investment regressions reflect this. After a firm has reached a certain size, further investment becomes unprofitable, and profits are simply paid out to the owners. Under such conditions investment in the older firm is limited to replacement, which can usually be financed out of depreciation. Hence the positive and often significant coefficients for depreciation.

The above considerations explain why we should not expect the profits coefficient to be positive. They do not explain why it should be *negative*. The only reason we can adduce to possibly explain this concerns the slope of the industry supply curve. If the curve is sloping upward and to the right, then the oldest firms, which have presumably completed their investment programs, will have the largest profits. While the newer firms just entering the industry would be expanding capacity and at the same time experiencing the smallest profits just because, as recent arrivals they are on the upper end of the industry supply curve.

We conclude from the above that the investment demand function which we have obtained for footwear, wearing apparel and leather products is a good fit for our sample of firms. But it is not an industry demand function, or even a good approximation to it.

Rubber, Chemical Products, and Petroleum. This group consists of firms engaged in the manufacture of rubber tires, gasoline and fuel oil, fertilizer and drugs. It is generally characterized by high capital-labor ratios and the average size of firm is large.

Regression fits for this group are among the best obtained. The simple linear regressions display a strong profits-push, and this is confirmed by the logarithmic and also the ratio fits. The profit variable is significant at the .05 level in 5 out of 6 fits. R_{t-1} is significant in both the linear and logarithmic fits. Sales, on the other hand, does not show up as significant in the linear or logarithmic fits, but sales lagged one period is significant at the .05 level in the ratio regression. In the ratio regression depreciation is positive and significant in both fits. When one looks at this industry, one is impressed at how similar its behavior is to large firms in the ratio regressions, and how similar its behavior is to small firms in the linear regressions. This is explained by the large number of wholly owned subsidiaries in the industry. Out of a total of 19 firms in this industry group, 12, or almost two thirds, were foreign subsidiaries.[3] As will be explained later, foreign subsidiaries are likely to display an unusually strong profits-push type of investment behavior. This results from institutional constraints on their use of outside capital, precisely because

---

[3]The firms were: Firestone Tire and Rubber; Goodrich International Rubber; Goodyear Tire and Rubber; Colgate-Palmolive (Phil.), Inc.; Philippine Refining Co.; Philippine Match Co.; United Laboratories; Winthrop-Steams, Inc.; Caltex (Philippines), Inc.; Shell Co. of the Philippines, Inc.; Standard Vacuum Oil Co.; Tidewater Oil Co., Inc.

they are wholly owned subsidiaries. They also generally utilize highly capital-intensive technology, and they are relatively large, so that they also display the sales-pull element in their behavior, as we have seen typical of these large firms previously.

Basic Metal and Non-Metallic Mineral Products. This industry group covers firms producing glass, cement, structural concrete products and iron and steel products. Regression fits of the linear model give highly significant t-values for profits. Neither sales, nor depreciation nor previous period capital stock are significant. The dummy variable is negative but not significant in both fits. The logarithmic regression is a distinctly poorer fit, and profits is no longer significant. Previous period capital stock becomes significant, and the dummy variable remains negative but not significant. On the other hand, the ratio model gives good fits with highly significant coefficients for lagged sales, current period profits, retained earnings, depreciation and the dummy variable. Ratio Equation II (VII) seems to be the best fit we obtained for this industry.

Metal Products, Excluding Machinery and Transport Equipment. Firms in this group include those making fabricated structural iron and steel and other fabricated metal products such as heating, cooling and plumbing equipment (except electrical), hand tools and general hardware. Linear regressions for this group produce fairly high correlation coefficients, but little in the way of significant regression coefficients. The fits shown in Table 3A show profits as either not significant or with the wrong sign. Sales and depreciation are also not significant. Only capital stock from the previous period is significant. The logarithmic fit is somewhat better, because sales lagged one period is significant at the .05 level. On the other hand, the ratio fit shows sales in the current period as highly significant while all the other coefficients are to be dismissed because either they have the wrong sign or they are not significant.

Heavier Industries. This industry group consists of firms which manufacture machinery of all types (including electrical) and transport equipment, which consists primarily of motor vehicles, but also includes shipyards. Linear regression fits gave poor results for this group. No coefficients are significant, and the correlation coefficients of between .20-.25 are unusually low. Transformation of the data into logarithms helped somewhat, so that profits is positive and almost significant at the .05 level, and the dummy variable is consistently negative. Fits using the ratio model yield equally disappointing results. In general, therefore, we feel that the Heavier Industry Group gave the least satisfactory results of our tests.

There is a special reason for this. It happens that "heavy" industry refers to enterprises that would be classified so in a developed country. In this country, however, the complexity of the manufacture of automobiles, heavy machinery, and similar products means that a large part of the inputs are in fact imported already fabricated, requiring little fixed investment. This can be seen from the following data, which show the relationship between investment in fixed assets and inventory investment for the industries that compose our "Heavy Industry Group" and for all manufacturing. (The data relate to the year 1961, which is the most recent Census data available.)

Investment in Fixed Assets and Inventory, All Manufacturing and Selected Industry Groups, Current Prices, 1961

	Expenditures for Fixed Assets (mill. pesos)	Inventory Investment (mill. pesos)	Total (M ₱)	Expenditures for F.A. as % of Total Investment (per cent)	Inventory Investment as % of Total Investment (per cent)
All Manufacturing	430	186	616	70	30
Heavier Industries	19	29	48	39	61
Machinery, excl. electrical	11	14	25	44	56
Machinery, electrical	4	2	6	66	33
Transportation equipment	4	13	17	24	76

Source: Bureau of the Census and Statistics, *Economic Census of the Philippines: Manufacturing*, V. III, Tables 21 and 22.

Clearly, for Heavier Industry, investment in fixed plant and equipment is a relatively minor part of total investment. This is most true of transportation equipment, and only somewhat less so of non-electrical machinery. Hence, with this industry group, we are really fitting functions which take as their dependent variable only a *part* of the dependent variable since our investment data are for fixed assets. Even if there is a good relationship between total investment and the explanatory variables in our models, it probably would not show up much here.

We would like to remark in passing that the situation in Heavier Industries Group may be approximated to some degree in many industries in an underdeveloped country. Import substitution in "heavy" manufactures has been confined to establishing industries with a relatively smaller fixed asset component than similar industries located in developed countries. To this extent, perhaps more attention should be devoted to developing countries.

<u>Metal Group (Joint)</u>. This group was formed by pooling firms in the basic metal and non-metallic mineral products group and in metal products excluding machinery and transport equipment. In most cases the regression fits for this group are inferior to those derived from either of the industries separately. However, the dummy variable, is often negative and significant in the pooled regressions. The reason for this is that each of these industries has somewhat different investment demand functions -- the basic metal and non-metallic mineral products a stronger profits-push function in contrast to a more significant sales variable in the metal products group. The dummy variable appeared as generally negative, and often significant at the .05 level.

Effectiveness of Tax Exemption in Increasing Investment

A dummy variable was used to differentiate the firms which enjoyed tax-exemption privileges from the remainder of our firms. Those granted tax-exemption were assigned a variable value of "1" while all others a value of 0. A positive coefficient means that the enjoyment of tax exemption makes a tax-exempt firm invest more than others.

In general we did not find any strong evidence that tax exemption contributed significantly to the investment demand of the beneficiary firms. This can be explained by the timing of the study and should not be misunderstood to mean that tax-exemption is ineffective as an instrument of encouraging investments. The pooled regressions showed no evidence of the effectiveness of tax-exemption. In the non-pooled regressions, there were quite a number of fits which yielded nonsignificant coefficients. Only firms in the food and footwear, wearing apparel and leather industries appeared to have of themselves relatively higher levels of investment demand because of their tax-exempt status.

Some coefficients, however, were negative and significant. These are found in regressions for textile, rubber, chemical and petroleum, and (joint) metal groups. Textile mills are their main beneficiaries of tax-exemption in the textile group while the tire factories and the drug manufacturing firms have dominated the tax-exempt firms of the rubber, chemical and petroleum group. The construction materials industry, on the other hand, have dominated the (joint) metal groups.

The evidence shows that on the whole tax exemption had different effects on different industries. Why would the effects be not uniformly to increase investment demand? In order to answer the question we have to explain the nature of tax-exemption at the time of the period of study. The tax-exemptions were made for all forms of taxes under Republic Act 901. The original privileges were granted to firms that qualified as "new and necessary" industries in the early and mid-fifties.* At the time of the study, all the firms granted tax-exemption privileges were already facing the expiration of the law within a year or two. The law provided for a gradual termination of the tax-exemption privileges enjoyed by the grantees. While the tax-exemption privileges were getting phased out, this did not preclude

---

*There were "new and necessary industries" which were encouraged by Republic Act 35, which was passed in 1946. But this law did not elicit the response that was given the more liberal, later legislation.

the necessity of testing to what extent the tax-exempt firms differed in behavior from the non-exempt. Could firms granted earlier tax concessions be behaving differently from those that did not? The results that we have derived tend to show that if tax-exemption privileges were at all a powerful influence in the investment decision, it was no longer evident during the period of the study. The tax-exemption variable was no longer significant, and the firms when studied as a group appeared to show similar investment behavior patterns.

Thus, we are inclined to believe that, in most cases, tax exemption effects on investment were usually swamped by other variables more powerful in their own right, such as sales and profits.

These observations have prompted us to try regressions similar to the model described earlier in our discussion of the behavior of large and small firms. To examine further if tax-exempt and non-tax-exempt firms displayed any specific differences in investment behavior and to see if we could isolate any possible effects of tax-exemption when we use a different investment demand specification, we disaggregated the large and small firms into tax-exempt and non-tax-exempt, and later pooled all the tax- and non-tax-exempt firms. Then we ran the regressions separately on these data. The results are as follows:

Large firms:

Tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(7.332)}{-1.663} + \underset{(0.196)}{0.451} \frac{I_{it-1}}{K_{it-2}} + \underset{(0.069)}{0.130} \frac{\Delta S_{it-1}}{S_{it-2}} + \underset{(0.148)}{0.168} \frac{P_{it-1}}{K_{it-2}} + u_{it}$$

$R = .49$

Non-tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(6.974)}{-0.697} - \underset{(0.481)}{0.191} \frac{I_{it-1}}{K_{it-2}} + \underset{(0.190)}{0.332} \frac{\Delta S_{it-1}}{S_{it-2}} + \underset{(0.160)}{0.141} \frac{P_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.44$

Small firms:

Tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(7.095)}{10.605} + \underset{(0.092)}{0.452}\frac{I_{it-1}}{K_{it-2}} - \underset{(0.032)}{0.015}\frac{\Delta S_{it-1}}{S_{it-2}}$$

$$- \underset{(0.355)}{0.187}\frac{P_{it-1}}{K_{it-2}} + \underset{(0.321)}{0.274}\frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.68$

Non-tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(6.074)}{11.096} - \underset{(0.056)}{0.034}\frac{I_{it-1}}{K_{it-2}} + \underset{(0.123)}{0.056}\frac{\Delta S_{it-1}}{S_{it-2}}$$

$$- \underset{(0.083)}{0.016}\frac{P_{it-1}}{K_{it-2}} + \underset{(0.138)}{0.391}\frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.50$

Pooled tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(4.759)}{5.503} + \underset{(0.074)}{0.429}\frac{I_{it-1}}{K_{it-2}} + \underset{(0.028)}{0.007}\frac{\Delta S_{it-1}}{S_{it-2}}$$

$$- \underset{(0.192)}{0.001}\frac{P_{it-1}}{K_{it-2}} - \underset{(0.173)}{0.168}\frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.63$

Pooled non-tax-exempt.

$$\frac{I_{it}}{K_{it-1}} = \underset{(3.847)}{4.995} - \underset{(0.055)}{0.032} \frac{I_{it-1}}{K_{it-2}} + \underset{(0.098)}{0.082} \frac{\Delta S_{it-1}}{S_{it-2}} + \underset{(0.076)}{0.028} \frac{P_{it-1}}{K_{it-2}} + \underset{(0.114)}{0.352} \frac{R_{it-1}}{K_{it-2}} + u_{it}$$

$R = 0.50$

Although from the viewpoint of the multiple R criterion, these results are nowhere near to being successful fits, it is evident that they convey interesting conclusions. There is rough homogeneity of behavior, respectively, of larger firms and of small firms, whether tax-exempt or not, when it comes to measuring the effects of sales and profits. The large firms are highly influenced by sales-pull while the small firms appear to be dominated more by profits-push via retained earnings, a finding that we found by just examining regressions for large and small firms. But the profits-push among small firms is much stronger in the non-tax-exempt firms. It should also be pointed out that profits-push appears evident and near to being statistically significant in the large tax-exempt firms and that the value of the coefficient of sales growth coefficient of the non-tax-exempt firms is higher, implying that on the whole the large non-tax-exempt firms had more sales-pull behavior on the whole than the tax-exempt. The fundamental difference in behavior of the tax-exempt firms from the non-tax-exempt concerns the effect of the rate of growth of past year's increase in the capital stock. In this respect the large and small firms behaved similarly. In the non-tax-exempt firms the same variable is not significant. The sales-pull is the dominating variable for the large non-tax-exempt firms and the profits-push in the small.

Incidentally, the above observations are not immediately revealed from the pooled regressions also reported, because of the apparent swamping effects of the non-tax-exempt firms in the samples. This is an interesting example of the importance of disaggregating the firms by controlling firm size or industry grouping.

In view of the varied evidence we have now evaluated, we can say that tax-exemption, of itself, could not have been a single dynamic force in attracting investment without the support of either a profits mechanism or of a sales pull. And such difference as may be observed in terms of the major propelling economic mechanism is fundamentally a result of firm behavior as a function of size. In this connection, it may be worthwhile to point out that a study of the rates of return of tax- and non-tax-exempt firms in Philippine manufacturing relying on the same set of data used in this study has shown that, in general, mean rates of return of both classes of firms were essentially the same but that the rates of return of the tax-exempt firms had far greater variability than those of non-tax-exempt firms.[4] We now interpret this result to mean that both classes of firms have essentially the same economic response mechanisms depending on their size class to the demand for investment but that the tax-exempt firms may have been influenced by additional variables. Thus we note that, in addition to the importance that previous year's capital stock growth exerts on the current growth of the capital stock, profits appeared to show a somewhat stronger role than is evidenced by the modal behavior of "large" and "small" firms.

Investment Demand of Foreign Subsidiaries

In our study of firms classified by size and by industry group, we come to the conclusion that ownership may

[4]G.P. Sicat, "Rates of Return in Philippine Manufacturing," (mimeographed, July 1965, IEDR), forthcoming in the larger manufacturing study of the said author.

also affect investment behavior. We found that foreign subsidiaries were often found in the largest size class, and that many of these firms are also in the rubber, chemical and petroleum industry group. In general, these firms are characterized by a function which, although it has several explanatory variables, exhibits unusually strong profits-push elements.

The reason why subsidiaries rely so heavily on retained earnings as a source of investment finance arises from the fact that most of these firms are wholly-owned companies, and they rely primarily, and sometimes almost-exclusively, on the parent company for financing. It is obviously disadvantageous for the parent company to allow the subsidiary to declare profits, which would then be taken up in the parents' books as net income and subsequently loaned back to the subsidiary. Under this transaction the profits are taxed twice. Rather, the costs of supplies, etc. furnished by the parent to the subsidiary can be adjusted from time to time, thus allowing profits shown by the subsidiary to be exactly that amount necessary to finance expansion. That part of the subsidiary's profits which remain in this country will be taxed here; and that part which is repatriated in the form of higher costs of supplies, etc., will be taxed in the home country, thus double taxation is avoided. A final advantage of this procedure is that it prevents the accumulation of financial instruments on both subsidiary and parent balance sheets, which would probably create confusion in the minds of investors. For this reason, then, we can expect that subsidiaries' investment demand functions fitted on a cross section basis, will always exhibit a high profits-push character. In a sense, however, this result is spurious, because the profits of the domestic subsidiary will tend to be adjusted to investment requirements, rather than vice versa. Our results, however, indicate that there are other variables of importance in the subsidiary fits, and therefore we still feel that the results contribute materially to our understanding of investment behavior of these firms.

Effect of Capacity Utilization on Results

It was pointed out earlier that the regression fits we have been dealing with can only be expected to operate under conditions of full, or nearly full capacity utilization. Data on the capacity utilization of the firms were not available to us when we undertook our study. However, shortly after we completed our computations, the results of a survey of capacity utilization of manufacturing firms in the Philippines became available to us. That survey obtained useful results from 196 establishments. Their response measures capacity utilization in terms of per cent of rated capacity, for operations during the calendar year 1961. Approximately, the average utilization rate is 73 per cent.[5] If full capacity is taken as 90 per cent of rated full capacity, then this implies that firms, on average, were operating at about 81 per cent of full capacity.

This is a fairly high capacity utilization rate.[6] We would like to inquire now if there is still room for improvement of our fits if a variable measuring this quantity were available, especially on the industry regressions.

As an answer to this question, we ranked the data on the rate of capacity utilization by industry. We also ranked the multiple correlation coefficients for each of our regressions. We then computed the rank correlation coefficient between the two rank orders for each of our regression fits.

---

[5] R. Bautista, *op. cit.*, Table 1. The average we use is the unweighted arithmetic mean of the two-digit industry capacity utilization rates.

[6] In Pakistan, manufacturing industries have much lower capacity utilization rates. A study of 70 protected manufacturing industries by Nurul Islam shows that the modal rate of utilization of capacity is only about 30 per cent, and that about 80 per cent of the industries were in operation at 60% of capacity. See his "Tariff Protection, Comparative Costs,

The results are shown below.

Coefficient of Rank Correlation Between Rate of Capacity Utilization and Multiple Correlation Coefficient of Different Regression Models

Model	
SL I	.45
SL II	.40
Logarithmic I	.82
Logarithmic II	.28
Ratio I	.21
Ratio II	-.24

On the basis of these data, it appears the regression fits for the Log I model might have been improved significantly by inclusion of a variable measuring capacity utilization. Both linear models might also have shown some minor improvement in fit as well. Apparently Log II and both ratio models were least affected by the absence of a capacity utilization variable.

Our fits, which were all without a capacity utilization adjustment, were all reasonably good, and what evidence there is suggests that its unavailability did not materially

---

and Industrialization in Pakistan," paper presented in the AID-University of Wisconsin Conference on "Economic Interdependence in Southeast Asia," January, 1967. We would suspect that India's manufacturing industries come close to the above description.

affect the results. However, it may be pointed out that in countries where the capacity utilization rate is very low computations of investment demand would be highly dependent on capacity utilization. Perhaps, in the Philippines and other countries with roughly the same levels of capacity utilization, overcapacity is not as much of a drag on new investment than in other more developed countries. As Kuznets points out,[7] when population growth is low, errors of over expansion must rely heavily on rising per capita income for their correction. In contrast, when population growth is rapid, errors of overexpansion carry few penalties, because they are soon dissipated by a rapidly growing aggregate demand.

---

[7]Simon Kuznets, "Demographic Aspects of Modern Economic Growth", (Sec. 32). A paper read at the United Nations World Population Conference, Bèlgrade, August 30-September 10, 1965.

VIII. SUMMARY AND CONCLUSIONS

It is time to draw the various strands of our argument together in order to obtain a broad view of the important determinants of investment. The conclusions that emerge have special interest because they are the first that are based on a close shifting of quantitative data from a less developed country. Admittedly, some of these conclusions, to the extent that they depart from generally accepted views based on the experience of developed countries, may simply reflect institutional peculiarities of the Philippine economy. However, many of our conclusions possibly reflect conditions peculiar to underdeveloped countries generally, and they therefore warrant consideration as possible hypotheses for further testing here and elsewhere.

Profits. One of the major determinants of investment is profits. We obtained statistically significant coefficients for current period profits again and again, using different regression equations and after stratifying the data into subgroups. That investment demand is to a high degree profits-push in nature is especially clear from the industry regressions. This statement needs to be qualified: either profits-push is a result of the pure effects of net profits in the current period, or it is composed of net profits plus the volume of accrued depreciation allowances.

Take first current period profits as an explanatory variable. In the simple linear regressions (SL II), for example, the following industry groups had positive and significant profit coefficients: tobacco and beverages; textiles; wood and cork products; furniture and fixtures; paper, paper products and printing; rubber, chemicals and petroleum products; and metal products. Roughly the same pattern occurs in the logarithmic (Ln II) regressions although not as strongly. Profit is also a positive and highly significant determinant of investment for small firms (up to ₱2 million in assets) when the function is a linear one, which is also very clearly the best fit for small size firms. In the ratio regressions profit also is an important determinant of investment. The rate of profit $(\frac{P_t}{K_t})$ had at least some influence on the rate of investment $(\frac{I_t}{K_t})$ in wood and cork and furniture and fixtures; in paper and paper products; rubber, chemicals and petroleum; and in non-metallic and basic metal products. In general, it appears that in those industries when the role of the rate of profit in the Ratio models appeared to have a weaker influence compared to the corresponding SL or Ln regressions, other variables closely related to profits -- e.g., depreciation or retained earnings -- either tended to substitute or otherwise helped to weaken the influence of profits. But even then cases can still be correctly termed profits-push types of investment demand functions.

Depreciation. Depreciation, or charges for capital replacement, constitute another source of investment finance. In a very real sense, the depreciation of a capital asset serves as an occasion for new capital assets, in the form of replacement. In a well-known study of Evsey Domar, the importance of depreciation allowances as a source of investment finance is greatly emphasized. According to Domar, for the "average American firm" depreciation allowances may be able to finance two-thirds of all fixed capital requirements under stable price conditions, or about one-half under moderately inflationary conditions.[1]

While admittedly depreciation served a useful role as an explanatory variable in some regressions, we did not find it nearly as important a determinant as the view of

---

[1]Evsey Domar, "Depreciation, Replacement and Growth," in *Essays in the Theory of Economic Growth,* New York, Oxford University Press, 1957, Ch. VII.

Domar would suggest. We think that there may be a genuine divergence in the role of depreciation as a source of finance in underdeveloped countries like the Philippines compared to developed countries. First, accounting conventions are less rigid and, especially where the company is a closely held enterprise, there is great flexibility available to the owner in determining the depreciation methods to be adopted, and the consistency with which they will be applied from year-to-year. Second, in an industry which is just recently founded, and where the rate of investment is rising rapidly, the proportion of the capital stock subject to depreciation will be small relative to the total capital stock in place; hence depreciation accruals will be smaller and replacement demand may approach zero. Under such circumstances, which were rather closely approximated in the case of some industries established under the aegis of controls, the influence of depreciation on investment may be substantially reduced. This interpretation is roughly in accord with the results of our regressions. The most significant coefficients for depreciation were found in for the SL equations in the food, and tobacco and beverage groups -- all of these industries founded long before World War II. Significant coefficients were also found in the Ratio and II models for rubber, chemicals and petroleum, and for non-metallic minerals. The rubber group is heavily dominated by foreign subsidiaries, which constitute a special case.

Sales. The inclusion of sales as an explanatory variable in an investment function is a result of the importance given to it in various *a priori* formulations. We tried a variety of sales variables, including current period sales, sales of the previous period, and an average of current and previous period sales. A good many of the results appeared to contradict the *a priori* size restrictions which we imposed earlier. However, some rather clear, even if not decisive, conclusions emerge. When the average of two period sales was used, the coefficient was generally negative and, in virtually all cases, not significant at the .05 probability level. The variable $\frac{S_{t-1}}{K_t}$ can also be dismissed, as generally being non-significant. This leaves current and previous sales variables. In the pooled regressions, negative and significant coefficients were obtained for each of these sales variables, alternately depending on which equation was being used. For example, in the SL model S_{t-1} was an important determinant while in the Ln models S_t was significant; while the best results were obtained for S_{t-1} in the ratio fit. When stratified by size, S_t or $\ln S_t$ were useful in explaining the investment behavior of small sized firms (under ₱2 million assets), while for large size firms (over ₱12 million assets) either $\ln S_{t-1}$ or $\frac{S_{t-1}}{K_{t-1}}$ were most effective as determinants of investment behavior. In the industry regressions roughly the same conclusions emerge. Only S_t and S_{t-1} are really useful in explaining investment demand. When a SL model is fitted by industry, the textiles group is the only one with a sales pull, obtained by using S_{t-1}. When a logarithmic model is used only the metal products groups exhibit sales coefficients significant at the .05 levels. However, when the ratio model is used, 7 out of the total of 10 industry groups exhibit sales coefficients which are positive and significant. These industries are food; textiles; wood, cork and furniture; paper and paper products; rubber, chemicals and petroleum; non-metallic mineral products; and metal products. The balance of these significant coefficients are previous period sales.

These results suggest to us that a sales-pull element in investment demand does exist in a number of industries, and that more often than not it is past period sales that are most decisive in determining current period investment outlays. In a number of cases, however, current period sales are also effective determinants. Average of two period sales is so rarely useful as an explanatory variable that we feel it can be discarded in future studies. There is obviously a good deal of variation from one industry to another, and from one model to another. In general the ratio formulation is very much superior to the other models in catching sales-pull elements in the investment demand function. In this respect our results conflict with those of Edwin Kuh (p. 220) who concludes that in his ratio model the profits-push was generally more pronounced. With our sample it is just the reverse: profits push is strongest in the linear model while sales becomes generally effective only in the ratio model.

We also find it interesting that whereas for large firms the influence of sales is most significant with a ratio model, for small firms undoubtedly the best results were obtained by using a linear or logarithmic model. And whereas current period sales show up best in the small firm fits, it is sales lagged one period that is most effective in the ratio models fit for large firms.

Size of the Capital Stock in the Previous Year. Our results suggest that size of the capital stock in the previous year exerts some, although not usually a dominant influence on investment. This result is to be expected. The importance of the lagged capital stock variable depends on the relative importance of net to gross investment. In an underdeveloped country undergoing a rapid expansion in its capital stock, where only a small portion of total investment is for replacement, the lagged capital stock variable is not likely to be very important. The variable K_{t-1} appears as an explanatory variable in the SL and Ln regressions. In the pooled regressions it is significant for the logarithmic but not the linear models. In the regressions by size of firm, K_{t-1} was positive and significant only for firms with assets less than ₱1 million, for both linear and logarithmic models. In the industry regressions, positive and significant coefficients were obtained in tobacco and beverages; footwear and wearing apparel and leather goods; paper and paper products; rubber, chemical and petroleum, and metals. Food shows a coefficient which is negative and significant and confirms with the expectations of a capital stock adjustment model. This industry includes the sugar centrals, whereby the larger and more profitable centrals invested at the lowest rate because of the limitation on the market imposed by the sugar quota.

Effects of Tax Exemption on Investment. The influence of the policy of exempting new investment from taxation was examined by use of a dummy variable. The purpose of this variable was to permit a distinction between the investment functions of tax-exempt and non-tax-exempt firms. Tax exemption did not show a decisive contribution to the investment behavior of our sample firms. The tax-exempt firms in food and in footwear, wearing, and leather had significantly higher levels of investment compared to their non-tax-exempt status. But we also discovered some tax-exempt firms whose investment levels were lower relative to the non-tax-exempt. These are tax-exempt firms in the textiles, rubber, chemicals, petroleum, and metals.

On the whole we conclude that tax-exemption at the time of the study was no longer an important factor. Purely economic factors like profits and profit-related variables and sales have become more important. Although tax-exemption may have helped to push profits and therefore investment profits may have been a more powerful influence on investment demand in its own right.

Effect of Size of Firm on Investment Behavior. As a part of our analysis, firms were stratified into different size classes, by asset size. At various points in the discussion it has been noted that small firms (asset sizes under ₱3 million) tended to display a different investment function than large firms. In these small firms, the best fit is obtained with a linear model, and profits are highly significant. Previous capital stock (K_{t-1}) also plays an important role. The sales variable generally does not work too well with small firms; and when it does not in *current* period sales (SL I (IV)) and Ln I (V) and (VI) that is effective. In contrast, fits for large firms are not good, and when one does obtain a reasonably good fit for the large firms, it tends to be in the ratio model, and sales lagged one period is the most important explanatory variable.

We have investigated two types of hypotheses to account for these observed differences in behavior between small and large size firms. One hypothesis is that small firms are at a disadvantage in relation to the financial system, thus requiring them to rely more exclusively on retained profits as a source of funds for investment. Data on interest rates show little relationship between size and effective rates paid for the firm in our sample. Still, there may be discrimination in the availability of credit. What material we have found does not, however, substantiate this view either. On the other hand, we are in possession of considerable qualitative evidence indicating that many firms make ownership a goal of business. This is particularly true of family enterprises, and takes the form of an avoidance of distribution of equity outside the hands of the family. When complete ownership of the equity becomes an effective guidepost of enterprise policy, the movements in investment are necessarily closely linked to movements in profits. Even if bank financing is available, it will necessarily be limited to some ratio of the total equity; and equity is, in such cases, a reflection of the accumulation of past earnings retained in the business. This explanation also has the advantage that it explains the more effective role of K_{t-1} in small as contrasted to large firm behavior.

Our conclusion here is that the investment demand function of small firms is essentially a linear equation, with the volume of investment a function of profits (or retained earnings) and past period capital stock. The coefficient of profits is rather close to unity. This type of function is determined by organizational features of the small firm which impose a unique set of goals and behavior on its management. On the other hand, large firms are by definition firms which have decided to relinquish some or all of these features, including the most important -- that of maintaining complete ownership of equity with the family. This decision permits these firms to respond to anticipated increases in demand, rather than excluding on retained earnings. It is these firms in particular, which can create the demand for external financing which a nascent financial system can supply; for it is only these firms which have broken the umbilical cord between ownership and management control.

We conclude that the Arthur Lewis model of investment demand is meaningful primarily for small firms. However, as firms grow in size they are likely to alter their decision making apparatus, and the structure of their goals along with it. Then, they tend to respond more directly to changes in demand, and in so doing depart further and further from the Lewis hypothesis. As growth proceeds, it would seem that the Lewis model therefore becomes increasingly irrelevant, and needs to be replaced by a series of demand functions for each of the major industry groups. This transformation of the investment function of the firm has added significance for the theory of growth because if documented for other periods and economic sectors, it provides the explanatory link between a Lewis profits-push type of development, and the more familiar income-induced investment models in use for developing countries. Withoutthe appearance of this type of behavior, an accelerator type of investment response to growth of income (because of population and per capita income growth) cannot be validly postulated.

Investment Behavior of Foreign Subsidiaries. We have found what happens to be a different form of investment behavior in the case of wholly owned foreign subsidiaries. In brief, these firms exhibit behavior more similar to that of small firm, than to that of other large domestic firms in the same industry. Apparently the major reason is that, from a financial point of view they operate under similar constraint: maintenance of complete control with ownership. However, the similarity -- with small firms -- on the profits-push characteristics has a somewhat different origin: it reflects the desire of the subsidiary to finance investment exclusively through earnings rather than resorting to sale of securities to the parent company, in order to avoid double taxation. This is very easily and legally accomplished through adjustment of the prices of inputs supplied to the subsidiary by the parent. On the other hand, to the degree these subsidiaries do exhibit a rather pronounced sales-pull element in their investment behavior, and to the extent that their profits-push element can be discounted by virtue of its being an accounting phenomenon, their similarity in behavior with small firms is attenuated. Nevertheless, the effects on the growth of the demand for financial assets within the country, and possibly through this on domestic saving, remain unchanged.

Importance of Inventories

Our definition of investment as accumulation of fixed capital was meant to delimit the focus of this paper. This is in keeping with much previous work in this field. However, we noticed that in some industries where capital formation is largely composed of inventories and only to a minor extent of fixed plant and equipment, our specification of the investment function did not yield good results. This was the case in the transportation equipment and machinery industry groups. In these industries, the important component of investment is inventory, because it is cheaper for firms to "buy" their capital inputs in the form of semi-processed materials than to buy the capital goods outright. This suggests that at least in these cases investment theory ought to be concerned with the substitution between inputs of inventories and inputs of capital equipment, a point which tends to be overlooked when investment models of fixed capital are treated separately from models of inventory accumulation.

Distinction Between the Firm and the Industry

Throughout this study we have proceeded on the assumption that cross-section analysis of investment by a sample of firms in an industry yields conclusions with regard to the industry itself. In most cases this proved to be the case. In a few industries however -- notably footwear, leather products and wearing apparel -- this assumption proved to be inadequate. In these industries a considerable portion of investment is accounted for by new firms just entering the industry. We speculate -- and there is some foundation for this -- that the optimal size of the firm is small in these industries. The lesson seems clear. In any industry where a considerable portion of new investment is accounted for by new firms, cross-section analysis can only measure firm's investment behavior, but cannot deal adequately with the industry's investment behavior.

APPENDIXES

NOTE ON REGRESSION RESULTS REPORTED

The regression equations are all stated in full in pages 14-15.

Symbols:

SL = simple linear model

Ln = logarithmic model

Ratio = ratio model

N = number of observations per regression

The Roman numerals after the regression model (e.g., SL I) refer to the regression models as described in pages 14-15.

The second Roman numerals in parentheses after the regression model indicate the number of variables included in the regression, the constant included.

The numbers in parentheses under each coefficient is the standard error of the coefficient.

TABLE 1A. SUMMARY OF RESULTS FOR MANUFACTURING FIRMS, POOLED: SIMPLE LINEAR MODEL

Variables / lassification		Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
<u>Pooled</u>	N = 166									
SL I	(IV)	24.6308 (125.1054)	-0.0798 (0.0391)	0.0710 (0.0431)			0.7587 (0.1043)			0.5554
SL I	(VI)	41.2623 (176.2947)	-0.0794 (0.0394)	0.0723 (0.0439)			0.7935 (0.1419)	-0.2561 (0.6804)	-6.8606 (219.5435)	0.5560
SL II	(III)	-3.0180 (125.5243)				-0.0369 (0.0270)	0.7833 (0.1205)			0.5399
SL II	(VI)	60.6877 (179.0266)			-0.0162 (0.0124)	-0.0413 (0.0370)	0.8207 (0.1451)	0.4327 (0.8925)	-89.5338 (223.9298)	0.5472

TABLE 1B. SUMMARY OF RESULTS FOR MANUFACTURING FIRMS, POOLED: LOGARITHMIC MODEL

Variables / Classification	Constant	In S_t	In S_{t-1}	In K_{t-1}	In$(S_t+S_{t-1})/2$	In P_t	In D_t	Dum_t	R
Pooled N = 168									
Ln I (IV)	-0.9851 0.7829	0.8485 (0.3619)	-0.3876 (0.3051)			0.3893 (0.0986)			0.7096
Ln I (VI)	-0.2190 (0.7971)	0.7005 (0.3378)	-0.5525 (0.2912)			0.1995 (0.1029)	0.6006 (0.1187)	0.1627 (0.2134)	0.7591
Ln II (III)	-0.7173 (0.4243)			0.5924 (0.0761)		0.2685 (0.0761)			0.8377
Ln II (VI)	0.5718 (0.7904)			0.5083 (0.1629)	-0.0085 (0.1478)	0.2470 (0.0978)	0.1293 (0.1872)	0.1415 (0.2097)	0.7688

TABLE 1C. SUMMARY OF RESULTS FOR MANUFACTURING FIRMS, POOLED: RATIO MODEL

Variables / assification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
Pooled N = 159									
Ratio I (III)	13.2806 (2.1954)	0.0559 (0.0174)	-0.0690 (0.0194)						0.2819
Ratio I (VII)	17.0129 (3.5212)	0.0621 (0.0200)	-0.0679 (0.0209)		-0.0806 (0.0843)	0.0596 (0.0925)	-0.8013 (0.4489)	0.0928 (2.8919)	0.3200
Ratio II (V)	10.2034 (2.7830)	-0.0729 (0.0192)		0.0727 (0.0172)	0.0465 (0.0571)			3.8601 (2.8162)	0.3353
Ratio II (VII)	14.1760 (3.4478)	-0.0741 (0.0197)		0.0764 (0.0173)	-0.0852 (0.0818)	0.1899 (0.0889)	-0.9174 (0.4335)	3.8384 (2.7731)	0.3896

TABLE 2A. SIMPLE LINEAR, BY SIZE

Variables / …assification	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
Asset Sizes									
Very Small (Under ₱1 million) N = 38									
SL I (V)	86.5516 (51.6441)	-0.0838 (0.1114)	0.0438 (0.1177)			1.4944 (0.3800)		-97.3468 (55.1158)	0.6875
SL II (VI)	92.1264 (50.0939)			-0.0731 (0.0577)	0.1230 (0.0679)	1.4363 (0.3621)	-0.8753 (0.9974)	-108.1308 (53.4711)	0.7196
Small ₱1-₱2.9 million) N = 44									
SL I (IV)	19.0680 (52.9148)	0.0958 (0.0518)	-0.1084 (0.0408)			0.5079 (0.1328)			0.8629
SL II (V)	63.9827 (52.3816)			-0.0209 (0.0310)	-0.0545 (0.0464)	0.6928 (0.1363)	0.4710 (0.6831)		0.8629
Medium ₱3.0-₱9.9 million) N = 34									
SL I (VI)	373.1234 (195.4969)	0.0122 (0.0498)	-0.0260 (0.0575)			-0.1116 (0.1765)	0.9897 (0.6870)	115.6964 (225.2716)	0.3598
SL II (VI)	368.7135 (203.5884)			-0.0110 (0.0144)	-0.0121 (0.0957)	-0.0890 (0.1637)	1.1389 (1.3018)	116.0524 (225.8401)	0.3651

TABLE 2A. (Cont'd)

...ssification / Variables	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
...sset Sizes									
Large (₱10.0-₱15.9 million) N = 29									
SL I (V)	-2734.3171 (1081.4424)	0.3993 (0.2858)	-0.2140 (0.3246)			-0.6935 (0.4131)		1771.8295 (811.5589)	0.655…
SL II (VI)	-669.8498 (1637.1092)			0.0938 (0.1010)	-0.1712 (0.0903)	-0.3833 (0.4203)	2.6231 (1.4918)	706.1091 (905.1181)	0.733…
Very Large ₱16.0 and over million) N = 21									
SL I (IV)	537.1849 (1373.0908)	-0.0768 (0.1090)	0.0532 (0.1187)			0.8528 (0.3649)			0.5340
SL II (VI)	528.3153 (1819.4624)			-0.0136 (0.0418)	0.0480 (0.1392)	1.0100 (0.4735)	-2.6759 (3.8084)	549.8270 (1683.3644)	0.5447

TABLE 2B. LOG, BY SIZE

Variables / Classification	Constant	ln S_t	ln S_{t-1}	ln K_{t-1}	ln$(S_t+S_{t-1})/2$	ln P_t	ln D_t	Dum_t	R
Asset Sizes									
Very Small (Under ₱1 million) N = 39									
Ln I (VI)	0.0922 (2.6382)	1.5880 (0.8485)	-1.5348 (0.8069)			0.0344 (0.2499)	0.9035 (0.2946)	0.1122 (0.5278)	0.602
Ln II (III)	0.7932 (0.9706)			0.7231 (0.1840)		0.1443 (0.1617)			0.622
Small (₱1-₱2.9 million) N = 44									
Ln I (V)	-6.0285 (2.3183)	2.0445 (0.5201)	-1.0122 (0.3674)			0.2810 (0.1778)		0.8015 (0.3735)	0.770
Ln II (VI)	-2.8083 (2.5539)			-0.2443 (0.4056)	0.4912 (0.4108)	0.3176 (0.2235)	0.5943 (0.4519)	1.2025 (0.4543)	0.702
Medium (₱3.0-₱9.9 million) N = 34									
Ln I (VI)	4.3094 (1.5827)	-0.1046 (0.4542)	0.0983 (0.3921)			-0.2120 (0.1474)	0.5445 (0.1860)	0.4345 (0.3637)	0.605
Ln II (VI)	3.6328 (2.0110)			0.1481 0.2988	-0.0082 (0.1743)	-0.1951 (0.1516)	0.4376 (0.2730)	0.3789 (0.3815)	0.609

TABLE 2B. (Cont'd)

Variables / ssification	Constant	$\ln S_t$	$\ln S_{t-1}$	$\ln K_{t-1}$	$\ln(S_t+S_{t-1})/2$	$\ln P_t$	$\ln D_t$	Dum_t	R
sset Sizes									
Large (₱10.0-₱15.9 million) N = 29									
Ln I (VI)	5.7976 (5.0470)	-5.0732 (2.2182)	4.2983 (2.2645)			0.3653 (0.3238)	0.9835 (0.4756)	-0.3848 (0.6284)	0.7027
Ln II (VI)	3.4532 (10.5367)			0.2577 (0.7349)	-0.6467 (0.9982)	0.4602 (0.3986)	0.5902 (0.7827)	-0.7722 (0.8225)	0.6374
Very Large (₱16.0 and over a million) N = 22									
Ln I (IV)	0.5809 (2.5993)	0.5328 (1.2936)	-0.6272 1.2226			0.9245 0.3020			0.6357
Ln II (VI)	-0.9725 (2.8959)			0.2979 (0.3528)	-0.0223 (0.3094)	0.4062 (0.4159)	0.3082 (0.3812)	0.6689 (0.5142)	0.7086

TABLE 2C. RATIO, BY SIZE

Variables / Classification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
Asset Sizes									
Very Small (Under ₱1 million) N = 34									
Ratio I (VII)	27.8838 (10.1054)	0.0723 (0.0509)	-0.0998 (0.0568)		-0.2186 (0.5159)	0.3951 (0.5518)	-1.2727 (1.1469)	-10.2162 (9.8081)	0.3897
Ratio II (VII)	22.8952 (10.4778)	-0.0790 (0.0505)		0.0774 (0.0482)	0.1262 (0.5274)	0.0222 (0.5563)	-0.9918 (1.1687)	-2.9283 (9.7011)	0.3707
Small (₱1-₱2.9 million) N = 43									
Ratio I (III)	10.5310 (3.9943)	0.0821 (0.0256)	-0.0926 (0.0257)						0.3494
Ratio I (VII)	12.2253 (7.8085)	0.0680 (0.0313)	-0.0707 (0.0304)		-0.0788 (0.2899)	0.1452 (0.2684)	-1.1295 (0.8961)	5.2606 (6.0354)	0.5555
Ratio II (VII)	12.9159 (7.6138)	-0.0647 (0.0297)		0.0679 (0.0249)	-0.2620 (0.2799)	0.5004 (0.2481)	-1.9571 (0.8308)	9.8422 (5.7748)	0.5839

TABLE 2C. (Cont'd)

Variables / Classification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
<u>Asset Sizes</u>									
<u>Medium</u> (₱3.0-₱9.9 million) N = 33									
Ratio I (VII)	23.2354 (8.5772)	0.0253 (0.0512)	-0.0144 (0.0549)		-0.0977 (0.1062)	0.0517 (0.1251)	-1.6613 (1.2054)	1.0980 (6.7774)	0.2985
Ratio II (IV)	16.4123 (6.8815)	0.0063 (0.0213)			-0.0441 (0.0873)			-0.6051 (6.4472)	0.1911
Ratio II (VII)	20.4913 (7.7815)	-0.0713 (0.0440)		0.0721 (0.0309)	-0.0589 (0.0993)	0.1851 (0.1066)	-1.0702 (1.1255)	-0.1044 (6.2606)	0.4781
<u>Large</u> (₱10.0-₱15.9 million) N = 18									
Ratio I (VII)	-12.4132 (8.0238)	-0.0867 (0.1585)	0.1547 (0.1882)		-0.3205 (0.2324)	0.0888 (0.2123)	1.3734 (1.5162)	8.6871 (7.3281)	0.6014
Ratio II (VII)	-9.8649 (7.0860)	-0.1020 (0.1087)		0.1461 (0.1068)	-0.2301 (0.2007)	0.0903 (0.1835)	1.1094 (1.4467)	7.8252 (6.5143)	0.6488

TABLE 2C. (Cont'd)

Variables / lassification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
Asset Sizes									
Very Large (₱16.0 and over million) N = 21									
Ratio I (VII)	17.4319 (8.2010)	-0.1303 (0.1397)	0.0959 (0.1254)		0.0531 (0.3226)	0.1558 (0.3493)	1.1040 (1.7264)	4.6821 (6.1394)	0.4747
Ratio II (VII)	13.8000 (6 2773)	-0.3065 (0.0849)		0.2465 (0.0727)	0.0454 (0.2400)	0.1699 (0.2622)	0.1754 (1.3461)	4.7548 (4.4766)	0.7463

TABLE 3A. SIMPLE LINEAR, BY INDUSTRY

Variables / ssification	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
acco & Beverages									
SL I (V) N=11	-77.5483 (137.8690)	0.0323 (0.0174)	-0.0758 (0.0294)			-0.0748 (0.2169)	4.7581 (1.4243)		0.9042
SL II (IV) N=11	-48.3209 (142.7661)			-0.0084 (0.0050)	0.1019 (0.0321)	0.4039 (0.1477)			0.8749
tiles									
SL I (IV) N=10	427.6460 (1385.6698)	-0.8693 (0.3596)	0.9901 (0.2887)			1.3613 (1.1062)			0.9443
SL II (VI) N=10	564.6978 (2650.7411)			0.1244 (0.6877)	0.4552 (0.6119)	3.1522 (2.2947)	-12.2888 (8.2519)	-1237.8408 (3020.3924)	0.9065
SL I (VI)	562.4330 (1669.4509)	-1.5692 (0.6523)	1.6987 (0.6134)			-0.4150 (1.7415)	12.7676 (9.4346)	-1365.1906 (1344.5179)	0.9627
er Products, inting, etc.									
SL I (VI) N=18	211.8589 (268.3657)	-0.3587 (0.2940)	0.3220 (0.2776)			1.3134 (0.7343)	-0.4668 (1.9326)	175.0025 (252.6848)	0.8094
SL II (V) N=18	372.0122 (168.7546)			-0.1371 0.0600	0.2685 (0.0832)	1.1573 (0.3759)	-3.4636 (1.7781)		0.8827

TABLE 3A. (Cont'd)

Variables / assification	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
Industries									
Food									
SL I (IV) N = 18	-196.6481 (432.1454)	0.2943 (0.2109)	-0.2421 (0.2045)			-0.6278 (0.5864)			0.4215
SL II (V) N = 18	-337.0757 (327.0690)			-0.0209 (0.0438)	-0.3182 (0.0714)	0.3563 (0.3776)	9.7718 (2.8946)		0.8025
Footwear, Wearing, Leather									
SL I (VI) N = 14	-18.1739 (113.7984)	0.2626 (0.1772)	-0.1819 (0.1621)			-2.2511 (0.8773)	4.3243 (4.8604)	183.5352 (153.0394)	0.7224
SL II (V) N = 14	135.2909 (62.0095)			-0.0202 (0.0661)	0.6642 (0.1371)	-0.0962 (0.4787)	10.6622 (4.4398)		0.8962
Rubber, Chemicals, Products of Petroleum									
SL I (VI) N = 21	107.5029 (187.7817)	-0.0767 (0.0402)	0.0650 (0.0409)			0.1371 (0.0266)	1.2465 (0.1332)	-100.2937 (218.3149)	0.9889

TABLE 3A. (Cont'd)

Variables / ssification	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
ndustries									
Metal Products Excl.Elec.									
SL I (V) N = 14	101.7675 (98.4573)	0.0502 (0.0436)	-0.0115 (0.0443)			-0.2042 (0.0973)	0.4384 (0.4465)		0.6926
SL II (III) N = 14	109.4612 (72.5535)				0.0752 (0.0193)	0.0450 (0.0496)			0.7621
leavier Industries									
SL I (V) N = 20	173.6900 (123.6583)	0.0157 (0.0557)	-0.0001 (0.0488)			-0.1508 (0.1869)	9.9178 (134.5041)		0.2263
SL I (VI) N = 20	173.6472 (127.9997)	0.0149 (0.0625)	0.0002 (0.0516)			-0.1503 (0.1942)	0.0352 (1.0482)	8.1426 (148.9186)	0.2265
SL II (VI) N = 20	180.1452 (119.3036)			0.0211 (0.0266)	-0.1062 (0.0821)	-0.0777 (0.1822)	0.4976 (0.9951)	38.7292 (142.2537)	0.3892
etal Products (Joint)									
SL I (V) N = 27	954.6935 (449.7393)	-0.1421 (0.1518)	0.0874 (0.1654)			1.0019 (0.2578)		-908.0412 (473.0353)	0.7763
SL I (VI) N = 27	697.1995 (465.2403)	0.2092 (0.1531)	0.1486 (0.1648)			0.8837 (0.2607)	1.6454 (1.0470)	-749.9476 (468.9051)	0.8028

TABLE 3A. (Cont'd)

Variables / Classification	Constant	S_t	S_{t-1}	$(S_t+S_{t-1})/2$	K_{t-1}	P_t	D_t	Dum_t	R
Industries									
Metal Products (Joint)									
SL II (IV) N = 27	50.0450 (222.3305)			0.1411 (0.0520)	0.1433 (0.0510)	0.9868 (0.2188)			0.801[illegible]
SL II (VI) N = 27	465.3080 492.0957			-0.1186 0.0599	0.1150 (0.0788)	0.9250 (0.2602)	0.0537 (1.3254)	-484.5437 (514.4185)	0.810[illegible]

TABLE 3B. LOG, BY INDUSTRY

Variables / Classification	Constant	In S_t	In S_{t-1}	In K_{t-1}	In$(S_t+S_{t-1})/2$	In P_t	In D_t	Dum_t	R
Industries									
Tobacco & Beverages									
N = 12									
Ln I									
Ln II (III)	-1.9689 (1.0712)			0.7569 (0.1933)		0.2393 (0.1876)			0.9245
Wood, Cork, Furniture & Fixtures									
N - 10									
Ln I (V)	-2.3518 (3.7156)	-1.3782 (1.8142)	2.1473 (1.7415)			-0.0896 (0.4385)		0.3711 (1.7218)	0.9334
Ln II (V)	-2.3422 (3.1143)			2.0852 (0.8379)	-0.9466 (0.7611)	0.3422 (0.2954)	-0.5512 (0.7780)		0.9597
Textiles									
N = 10									
Ln I (VI)	14.4540 (7.7203)	-7.4033 (3.8796)	3.8377 (3.3083)			1.7400 (0.8983)	2.8846 (1.5324)	4.0692 (1.8022)	0.8885
Ln II (VI)	10.1896 (9.0167)			0.7676 (1.8769)	-3.3712 (2.4832)	2.5878 (1.4682)	0.8428 (1.9917)	-3.4535 (2.2599)	0.8200

TABLE 3B. (Cont'd)

Variables / assification	Constant	In S_t	In S_{t-1}	In K_{t-1}	In$(S_t+S_{t-1})/2$	In P_t	In D_t	Dum_t	R
Industries									
Paper, Paper Products, Printing, etc. N = 18									
Ln I (V)	1.8383 (5.6975)	3.3779 (2.2192)	-2.9851 (1.9103)			0.6097 (0.7075)		-0.3351 (0.7018)	0.7359
Ln II (V)	1.9698 (5.8808)			0.1561 (0.8285)	-0.2225 (1.1564)	0.0141 (0.7400)	-0.3878 (0.8165)		0.7359
Food N = 18									
Ln I (VI)	-2.4535 (3.9334)	-0.5141 (2.1383)	0.8383 (2.3603)			-0.0826 (0.3748)	1.0235 (0.5278)	1.1630 0.9174	0.8186
Ln II (VI)	-4.5116 (3.6710)			1.0608 (0.6472)	0.5995 (0.7087)	-2.785 (0.3559)	-3.4638 (1.0412)	0.9744 (0.6935)	0.3535
Footwear, Apparel Leather N = 13									
Ln I (VI)	4.3937 (5.5300)	0.7093 (1.2992)	-0.9422 (0.8211)			-1.0890 (0.5858)	1.4942 (0.7751)	1.1643 (1.0243)	0.7568
Ln II (VI)	9.7541 (5.4628)			-1.8216 (1.1058)	-0.5065 (0.8728)	-1.3493 (0.5772)	4.0344 (1.5954)	2.1629 (1.1127)	0.8035

TABLE 3B. (Cont'd)

Variables / Classification	Constant	In S_t	In S_{t-1}	In K_{t-1}	$In(S_t+S_{t-1})/2$	In P_t	In D_t	Dum_t	R
Industries									
Rubber, Chemicals, Petroleum N = 20									
Ln I (VI)	3.1652 (3.5011)	-0.6520 (1.1712)	0.2130 (0.9164)			0.7606 (0.3866)	0.4108 (0.3273)	-0.8557 (0.7935)	0.8979
Ln II (VI)	0.5834 (3.2783)			0.7423 (0.4838)	-0.2773 (0.5740)	0.6346 (0.2957)	0.3466 (0.5939)	0.9214 (0.6847)	0.9125
Metal Products (33,34) N = 13									
Ln I (VI)	3.5347 (6.6628)	-1.0083 (2.2298)	0.3092 (1.4791)			0.2962 (0.3655)	1.2977 (1.3500)	-0.2469 (0.7524)	0.8672
Ln II (III)	-0.8152 (1.3530)			0.7952 (0.2770)		0.1328 (0.2039)			0.8746
Metal Products (35) N = 12									
Ln I (V)	0.1044 4.0048	1.9296 0.7830	1.7852 (0.4984)			-0.1754 (0.3047)	0.8194 (0.3648)		0.8722
Ln II (V)	5.3824 (7.2277)				-0.6049 (1.4049)	0.1138 0.5382	0.6487 (1.0914)		0.5159

TABLE 3B. (Cont'd)

Variables / ssification	Constant	In S_t	In S_{t-1}	In K_{t-1}	In$(S_t+S_{t-1})/2$	In P_t	In D_t	Dum_t	R
ndustries									
Heavier Industry N =20									
Ln I (V)	8.1012 (4.4612)	-0.5767 (1.4313)	0.4205 (0.9309)			0.8869 (0.5425)		-0.7142 (0.3707)	0.4574
Ln II (VI)	7.8218 (3.7474)			0.1720 (0.4659)	-1.1345 (0.7030)	0.8092 (0.4988)	0.1707 (0.4787)	-0.7857 (0.3364)	0.4898
Metal Products 33,34,35, Joint N = 27									
Ln I (VI)	0.5846 (2.0501)	1.4726 (0.6056)	-1.0519 (0.5176)			-0.0534 (0.2276)	0.4631 (0.2591)	-1.0193 (0.5866)	0.7522
Ln II (III)	-0.1311 (1.1217)			0.7508 (0.2142)		0.0014 (0.1623)			0.7129

TABLE 3C. RATIO, BY INDUSTRY

Variables / Classification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
Industries									
Beverages & Tobacco									
N = 9									
Ratio I (V)	13.8751	-0.0054	-0.0071		0.0176	-0.1309			0.7460
	(3.7498)	(0.0354)	(0.0347)		(0.0474)	(0.0791)			
Ratio II (IV)	12.0487	-0.0476		0.0353	-0.0017				0.6488
	(3.7679)	0.0262		(0.0232)	(0.0480)				
Wood Cork & Furniture Products									
N = 11									
Ratio I (VI)	10.3268	-0.0580	0.0617		0.7997	-0.7225		6.4728	0.8574
	(6.3693)	(0.0268)	(0.0409)		(0.7802)	(0.5543)		(6.8197)	
Ratio II (VI)	9.2989	-0.0549		0.0577	0.0855	-0.6748		6.9167	0.8988
	(5.5692)	(0.0193)		(0.0271)	0.3206	(0.4387)		(5.6448)	
Textiles									
N = 11									
Ratio I (VII)	38.2221	-1.0138	1.0057		-0.2957	0.4849	5.7888	-28.9651	0.7202
	(24.2738)	(0.7814)	(0.8444)		(2.4960)	(2.6050)	10.7222	22.3483	
Ratio II (VI)	23.4194	-0.5943		0.5171	-0.1888		5.5583	-20.0814	0.9440
	(10.9141)	(0.1026)		(0.1020)	(0.3812)		(2.6391)	(8.9354)	

TABLE 3C. (Cont'd)

Variables / Classification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
Industries									
Paper, Paper Products, Printing									
N = 18									
Ratio I (VII)	21.2577	0.4339	-0.4656		0.6231	0.8916	-2.6088	-8.6201	0.7946
	(9.1903)	(0.1305)	(0.1447)		(0.8154)	(0.8261)	(1.2748)	(8.6607)	
Ratio II (V)	7.1597	-0.1821		0.1937	0.3807			-1.8164	0.9056
	(5.0400)	(0.0364)		(0.0274)	(0.2288)			(5.1846)	
Food									
N = 16									
Ratio I (VII)	-3.0032	0.0914	-0.0710		-0.2601	-0.1610	0.7037	14.1137	0.5625
	(16.7079)	(0.1419)	(0.1610)		(1.7100)	(1.7271)	(2.9261)	(13.2022)	
Ratio II (VII)	-13.4564	-0.1234		0.1325	0.9480	-1.0018	2.1478	18.6009	0.7571
	(13.1933)	(0.0705)		(0.0553)	(1.2972)	(1.3585)	(2.3862)	(10.5932)	
Footwear, Wearing, Leather Goods									
N = 12									
Ratio I (VII)	50.9249	0.0664	-0.0574		-0.2456	0.2265	-5.9477	-9.6486	0.5571
	(28.3700)	(0.1225)	0.0968		(0.8403)	(0.8455)	(6.1390)	(21.5821)	
Ratio II (V)	27.6611	-0.1223		0.0986	-0.0601			4.0795	0.5897
	14.5304	(0.0761)		(0.0657)	(0.2798)			(15.8935)	

TABLE 3C. (Cont'd)

Variables / ssification	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	R
ndustries									
Rubber, Chemicals, Product of Petroleum									
N = 19									
Ratio I (VII)	-41.4864	-0.0363	0.0560		0.3210	0.1940	7.4125	-10.6718	0.7752
	(19.8930)	(0.0998)	(0.1054)		(0.2343)	(0.2692)	(2.8158)	(9.4143)	
Ratio II (VII)	37.3572	-0.1422		0.1274	0.3913	0.1295	6.9255	6.0049	0.8508
	(16.6391)	(0.0693)		(0.0531)	(0.1848)	(0.2179)	(2.3492)	(8.0749)	
Basic Metal, Non-metallic mineral									
N = 13									
Ratio I (VII)	14.4432	-0.2376	0.2886		6.1641	-6.7401	6.1934	9.6285	0.7518
	(7.0088)	(0.1767)	(0.1499)		(2.4817)	2.9711	2.7612	7.5275	
Ratio II (VII)	12.4915	-0.2590		0.2240	4.5301	-4.7516	4.9335	7.5993	0.8748
	(5.1792)	(0.1142)		(0.0647)	(1.5742)	1.9709	(1.8132)	(4.8280)	
Metal Products									
N = 14									
Ratio II, (IV)	5.1329	0.1998		-0.1607					0.8483
	(6.1371)	(0.0408)		(0.0415)					
Ratio I (IV)	8.3200	4.1350	-0.1340		-0.1715				0.9378
	(4.0491)	(0.0172)	(0.0193)		(0.0676)				

TABLE 3C. (Cont.d)

Classification \ Variables	Constant	S_t/K_t	S_{t-1}/K_t	S_{t-1}/K_{t-1}	P_t/K_t	R_t/K_t	D_t/K_t	Dum_t	
Industries									
Heavier Industry									
N = 18									
Ratio I (VII)	32.6892 (13.2913)	0.0431 (0.0524)	-0.0664 (0.0514)		-0.0982 (0.2221)	0.0314 (0.2175)	-2.1921 (1.6456)	1.4060 (12.2576)	0.5
Ratio II (VII)	29.4937 (14.5480)	-0.0147 (0.0637)		0.0045 (0.0569)	-0.0347 (0.2426)	0.0277 (0.2333)	-2.1394 (1.8057)	3.3655 (13.0548)	0.4
Metal Group (joint)									
N = 27									
Ratio I (V)	22.4913 (4.8646)	0.1164 (0.0224)	-0.1290 (0.0257)		-0.1437 (0.0881)			-8.0818 (5.4435)	0.7
Ratio II (V)	22.3545 (6.5416)	0.1310 (0.0433)		-0.1056 (0.0441)	0.2505 (0.1153)			9.2353 (7.2425)	0.5