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Capital Investment Modelling in the Australian Footwear Industry

M. M. Greenwell

University of Wollongong
UNIVERSITY OF WOLLONGONG

DEPARTMENT OF ACCOUNTANCY

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by Mary M. Greenwell

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ABSTRACT

The aim of this paper was to explore the possible bridging between two areas of capital expenditure budgeting research, i.e. environmental conditions and capital investment modelling, using secondary data, and also to identify fruitful areas of primary research into capital investment decision-making. The modelling indicated a high degree of association between a measure of industry protection and capital investment in the Australian footwear industry. Thus the research was considered to be a relevant indicator of fruitful primary research into the probable relationship between protection, one aspect of the economic and political environment of footwear manufacturers, and capital expenditure budgeting processes.
INTRODUCTION

The emphasis on proposal evaluation techniques in the capital expenditure budgeting literature influenced some researchers to assert that because evaluation was only a part of the investment process, it was equally important to research the importance of environmental conditions [See Hoyle (1978) Lin (1979) Nicholls (1980) and Greenwell (1983b)]. In a closely-related area of the literature, i.e. capital investment modelling, the emphasis has been on attempts to identify the major determinants of capital investment, e.g. profits [See Junankar (1972) for a literature review, Grossman (1977) and Copeland (1980)]. This research attempts to bridge the two areas by including one particular aspect of the economic and political environment of the footwear industry, i.e. tariff/quota protection, along with other variables including profitability, in an investment model. The purpose of the modelling was two-fold: firstly to explore the probable role of protection in capital investment and secondly to provide input to a decision regarding the direction of future empirical research.

REVIEW OF PREVIOUS STUDIES

This review concentrates on the investment modelling research and is supplemented by a New Zealand paper in which investment behaviour was researched. Junankar [1972] in a review of the literature identified two types of investment models: naive accelerator and flexible accelerator. The first assumes that there is a symmetrical relationship between investment and demand characteristics such as sales. In the latter model the symmetry assumption is relaxed and two lags are taken into account. These lags have been identified as decision lags and delivery lags [Junankar 1972, p.33].

The decision lag might be purely due to the administrative reasons or, because of uncertainty, due to management being cautious. [Junankar 1972, p.62]

It was this type of process that was identified by Greenwell [1983(a) and 1984] whereby the accounting techniques for evaluation were preceded in the capital
expenditure budgeting process by the recognition of need for change, the operation of a trigger and the generation of an investment proposal.

In his review Junankar [1972] referred to extensive literature in which either the cost of capital or changes in output, were deemed to be the determinant of investment. He noted that some of the equations using profits as an independent variable "... have a fairly high explanatory power (high R²)". [Junankar 1972, p.66].

Strong profitability, in the absence of foreseeable changes, may increase confidence in the future, as well as providing some part of the funds necessary for financing future capital investment and thus may encourage increased capital expenditure. This is not to imply that a contrary argument cannot be made. If manufacturers are able to maintain a sufficiently high level of profits, while protected, it may be that there is less incentive to invest for the purposes of improving efficiency and effectiveness. Capacity factors could then perhaps explain the link between profitability and investment in that high utilisation could produce high profitability and create a need for further investment.

An implication drawn from the review was that the emphasis in investment modelling was on establishing the single most important variable.

... there are numerous variables vying for the place of the crucial determinant of investment. [Junankar, 1972 p.65]

A study of Copeland [1980, p.12] indicated that because the cost of capital and the rate of return determined the profitability of investment

... a satisfactory explanation of investment behaviour will only be possible when we have an adequate theory of how firms formulate their expectations as to the future path of key variables.

The assumption is that the key variables are either a measure of return, or the cost of capital or both. Although Grossman (1977) suggested that the impact of government could be either positive or negative in stimulating capital investment, his study did not refer specifically to industry protection.
The question of the relationship between government incentives and capital investment was also considered in the Butcher et al [1981] research paper published by the New Zealand Institute of Economic Research. Butcher et al [1981, p.11.1] were researching business investment behaviour.

A questionnaire was administered (during a personal interview) to two groups of companies:

- 109 of the 118 largest firms in New Zealand;
- 32 of a sample of 50 companies, randomly selected from "other" companies. [page 11.1]

Thus a broad cross-section of industries was included. One of the questions related to the effect of government incentives on the firms' capital investment decisions.

Butcher et al [1981 p.1.2] reported that:

Respondents were evenly divided on whether Government incentives affected their investment decisions, a surprising lack of acknowledgement of incentives given the extent of Government's interventions in the market in New Zealand.

It should be noted that incentives in New Zealand covered a wide range including export incentives and regional investment allowances. The survey was not seeking to establish a relationship between a particular type of protection and investment. However, 76% of respondent firms identified two major reasons for higher uncertainty compared with ten years earlier: "government-related and domestic-economy related" [page 11.7]. The increase in uncertainty was deemed to influence the firm, again with two major effects: "more cautious", "tighter commercial practices". This led to a conclusion that the reduction of uncertainty would probably increase investment.

Butcher et al [1981, p.1.11] further suggested:

... the need for clear and consistent government policy without unnecessary change or prevarication.
With approximately 50% of the respondents indicating that government actions were directly related to uncertainty and that uncertainty had an impact on capital investment, it appeared that in New Zealand, at least, the reduction of uncertainty would promote investment.

From the review it appeared that variables such as profits and sales would be worthy of inclusion in a capital investment model and that a measure of government incentives may be significant.

RESEARCH HYPOTHESES:

H₀ No. 1 The variation in the level of capital investment in the footwear industry is not associated with changes in the protection level in the footwear industry;

H₀ No. 2 The variation in the level of capital investment in the footwear industry is not associated with production output in the footwear industry;

H₀ No. 3 The variation in the level of capital investment in the footwear industry is not associated with profitability in the footwear industry;

H₀ No. 4 The variation in the level of capital investment in the footwear industry is not associated with capital investment in all other manufacturing industry.

The following section discusses in some detail the derivation of and justification for each variable.

THE VARIABLES:

Data were collected from both public and private sources; collected, and collated in some instances, from ABS, IAC and Bureau of Industry Economics publications, and privately from the IAC. The period covered was from 1968/69 to 1981/82, a total of 14 observations. This period related to the availability of consistent measures of the data.
DEPENDENT VARIABLE: Capital Investment in the Footwear Manufacturing Industry in Australia

There are several points to be made about this variable. The source is the Australian Bureau of Statistics (ABS); thus capital investment is that identified as capital investment by the ABS; fixed tangible assets. A broader definition [Nicholls, 1980, p.63] would include expenditure such as the commissioning of consultants for the implementation of an organisational development programme or even a study of production processes. Thus capital investment, as included, is substantially narrower than the preferred concept.

Another limitation of these statistics was that no provision was made for uncapitalised leasing. Attempts to obtain relevant data from the major machinery supplier to the industry and from ABS statistics were unsuccessful, and accordingly, unadjusted figures were used.

There is a difficulty in determining the nature of investment. Investment in equipment that used new technology had the same representation in the data as the purchase of replacement machinery of a similar technological level. Similarly, capacity expansion investment was impossible to determine. Thus, pragmatically, capital investment has been operationally defined as capital investment as reported by ABS.

The conversion of these figures from historical cost to constant dollar terms was considered. However it was not possible to similarly convert all other relevant variables (e.g. profitability) in this way and it was decided on the basis of consistency to include the unadjusted variable. This is not to imply that inflation was ignored. The inclusion of the fourth variable, capital investment in all other manufacturing industries, was considered to assist in accounting for inflation.

It is prudent at this point to echo a qualification made by Szenberg et al [1977, p.1]. The orientation of the research was conditioned by the accessibility and the nature of relevant data. In spite of this, the information was useful in indicating historical relationships as well as providing indicators of relevant areas for future primary research.
INDEPENDENT VARIABLE: Protection (Nominal Rate of Assistance) in the Footwear Industry

Protection refers to deliberate governmental actions designed to reduce the ability of foreign businesses to compete with local firms in the same industry. This protection, which is an artificially created barrier between an industry and a "free-trade" environment, can be created by restricting the flow of goods and services, by granting, directly or indirectly, economic subsidies to local firms, or by imposing a penalty on foreign competitors. The types of protection that successive governments have seen fit to provide to Australian industry are many and varied.

The footwear industry in Australia is primarily protected by tariff/quotas and it is this particular type of assistance which is addressed in this study. When an industry is protected by quotas, the sale of locally produced articles is promoted. When an industry is protected by tariffs, the price of the imported product is increased. The tariff/quota combination can also result in the levying of very high rates of duty on imports in excess of the quota licence.

The level of protection appeared to be important for several reasons.

A protected climate could stimulate increased interest in the idea of capital investment leading to an increase in the generation of proposals. At the same time, a positive climate, from the point of view of a major decision-maker in a footwear manufacturing firm, could enhance the viability of proposals. This could occur because of the perception of positive cash flows or profitability. Obviously this argument is somewhat simplistic because it ignores the probable negative consequence of sustained high levels of protection, i.e. organisational malaise, coupled with uncertainty regarding year-to-year protection levels. But it was the view of the researcher that the probable impact on the climate was sufficient reason to include a protection variable.
Further, the work of Butcher et al [1981] as discussed earlier, indicated that in New Zealand respondents were evenly divided on the effect of Government incentives on their investment decisions. This provided a further rationale for the tentative inclusion of a protection variable.

There are two publicly available measures of protection in the industry; the nominal rate and the effective rates of assistance. The measure used in this study was the nominal rate of assistance. It was defined by the Industries Assistance Commission (IAC) [Annual Report, 1970, p.22] as

\[
\text{The nominal rate of tariff protection for a product is taken as the ad valorem equivalent of the duty provided in the Customs Tariff ... The nominal rate for an industry is a weighted average of the nominal rates for the products made by the industry.}
\]

The effective rate was not used because the method of calculation was not consistent throughout the period of analysis [private correspondence with the IAC] and it was designed to make comparisons across industries at a point in time, and not across time [interview with an IAC officer]. Further the assumptions on which the calculations are based can be challenged [Norman, 1975]. Thus protection has been operationally defined as the nominal rate of assistance.

**INDEPENDENT VARIABLE - Production Output in the Footwear Industry**

Current sales of locally produced goods were likely to have had a direct and indirect influence on capital investment decisions. If a proposed capital investment related to existing products, current sales figures would have had an important influence on forecasts of future sales and hence, future cash inflows. If a proposed investment related to new products, the level of current sales could have influenced the optimism or pessimism in the proposal evaluation. Thus there were reasonable grounds for hypothesising that the level of investment was a function of the level of sales of local production.

Further, Butcher et al [1981, p.1.7] noted that in capital investment decision making:

\[
\text{About 50 per cent of firms said that "past sales" was the most important variable.}
\]
However, available sales statistics included both local and import sales. Because
import statistics were on a cost basis, it was not possible to adjust the sales figures to
accurately identify local sales. Accordingly, it was decided that production statistics
were the best available surrogates for local sales.

INDEPENDENT VARIABLE - Profitability in the Footwear Industry

Junankar [1972, p.67] reported that:

Most studies that include profits ... suggest that it is a statistically
significant variable.

However, profit data were not obtainable for the footwear industry, but return on
investment (i.e. profitability) figures were available from IAC Annual Reports. Thus
profitability was operationally defined as that measure of profitability as reported by
the IAC.

These were readily used as an alternative to profit in this analysis because they were
conceptually a better measure of the effectiveness and attractiveness of existing
investments. The current effective use of capital may have been an incentive to
consider further investment.

INDEPENDENT VARIABLE: Capital Investment - All Other Manufacturing
Industries

The rationale for inclusion of capital investment in all other manufacturing firms was
the observation that aspects of the total domestic economy were not being taken into
account. Thus a decision was made to reflect the impact of the economic and political
environment on capital investment by the inclusion of this variable. The variable is in
the same form as the dependent variable, i.e. it is in historical cost and bound by the
same definitional limitations.
RESULTS:

Using the variables as outlined previously, i.e. capital investment in the footwear industry and all other manufacturing industries, protection, i.e. nominal rate of assistance, profitability and production output for the footwear industry for the years 1968/69 to 1982/83 inclusive, several regressions were run using SPSS\textsubscript{x}, including both lagged and unlagged variables.

In this section, it is intended to identify the 'best fit' regression. The process by which this situation arose is available from the author. The results of the unlagged stepwise regression analysis, and the results of the Pearson correlations are presented in the text in Tables 1 and 2 respectively.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>STEP (limit .05)</th>
<th>ADJ R\textsuperscript{2}</th>
<th>(N=14)</th>
<th>FINAL CO-EFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOTWEAR INDUSTRY:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOMINAL RATE OF ASSISTANCE</td>
<td>1</td>
<td>.64</td>
<td>.99</td>
<td>124.39 (7.84)</td>
</tr>
<tr>
<td>PRODUCTION</td>
<td>2</td>
<td>.18</td>
<td>.45</td>
<td>0.14 (3.61)</td>
</tr>
<tr>
<td>PROFITABILITY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ALL OTHER MANUFACTURING IND:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CAPITAL INVESTMENT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Cumulative R\textsuperscript{2}</td>
<td></td>
<td></td>
<td>.82</td>
<td></td>
</tr>
</tbody>
</table>

F Statistic = 31.3, p < .001
Durbin-Watson = 1.27 (t statistic in parenthesis)
TABLE 2
PEARSON CORRELATION MATRIX

<table>
<thead>
<tr>
<th>INDEPENDENT VARIABLES</th>
<th>FOOTWEAR INDUSTRY</th>
<th>ALL OTHER MANUFACTURING INDUSTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOMINAL RATE OF ASSISTANCE</td>
<td>PRODUCTION</td>
</tr>
<tr>
<td>FOOTWEAR INDUSTRY:</td>
<td>1.0</td>
<td>-.37</td>
</tr>
<tr>
<td></td>
<td>-.28</td>
<td>-.37</td>
</tr>
<tr>
<td>ALL OTHER MANUFACTURING IND:</td>
<td>-.21</td>
<td>.57</td>
</tr>
</tbody>
</table>

DISCUSSION OF RESULTS:

The final F statistic was significant at .001 level of confidence and indicated that the equation was meaningful. In addition the adjusted R² indicated that the equation explained a high proportion of the variability in capital investment. The stepwise regression clearly demonstrated that the nominal rate of assistance provided the highest contribution to the variation in capital investment with production output being the only other significant variable. Therefore null hypotheses numbered one and two were rejected and hypotheses three and four were accepted at a 0.05 explanatory level.

The equation was examined for evidence of multicollinearity and auto-correlation. Inspection of the standard error was the initial step taken in testing for multicollinearity. This was quite large relative to the co-efficient, thus reference was made to the Pearson correlation matrix.
The results indicated that, although the variables were not completely independent, the degree of correlation was minor. An exception was the intercorrelation of .57 between capital investment in all other manufacturing industries and production output in the footwear industry. Whilst a correlation of such a degree between two variables is important, it was noted that multicollinearity does not affect the significance of the equation but only the relative importance of the variables. Given the dominance of the nominal rate of assistance variable, the problem of multicollinearity was not seen as critical. This was verified by Koutsoyiannis [1977, p.237]:

If "... strategically crucial explanatory variables happen to be strongly intercorrelated, the seriousness of the problem is greater than in the case of secondary factors being multicollinear, because the latter may be dropped from the analysis without seriously impairing the results.

To examine auto-correlation the residuals were observed, following the inconclusive result of the Durbin-Watson statistic. An inspection of the scatter plot confirmed there were no outliers. (See Koutsoyiannis 1977, p.202). Auto-correlation did not appear to be a major problem.

CONCLUSION:
It is contended that the association between capital investment and the nominal rate of assistance in the footwear industry is the start of a bridge between the two areas of capital investment research outlined earlier. Further it is contended that the association provided sufficient ground for more closely investigating the relationship. Thus the research was useful in illustrating probable historical relationships between capital investment and environmental conditions. Secondly this research, using secondary data, was useful in indicating the direction of future primary research. this primary research could be undertaken using a case-study approach, i.e. conducting semi-structured interviews with a small number of key decision-makers in footwear manufacturing firms. The structure could be based around the capital investment decision-making process. This research would extend extant capital investment research.
13.

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