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PROFITABILITY OF U.K. CONSTRUCTION CONTRACTORS

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by

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ABSTRACT

The paper describes three analyses to examine differences in construction company POT profitability between (1) different financial years, and (2) different sizes of companies. In the first analysis, the aggregated profitability of a sample of 80 UK general contractors was found not to differ significantly from 3.23 percent for each year of the period examined. The size (turnover) of companies however was significantly positive correlated with profitability.

The second analysis, of a sub-sample of 8 very large companies, showed that profitability enhancement was associated with diversification into housebuilding and other related activities.

The third analysis, of 110 speculative housebuilders, showed profit margins to be around four times those of general contractors but uncorrelated with company size. Systematic changes were found however over the period involved.

In all cases, the variability of profitability between companies was found to reduce with company size, implying

a greater consistency in the financial performance of larger companies.

Keywords: Profitability, company size, turnover growth, diversification, pricing policies.

INTRODUCTION

In the business cycle, the achievement of an appropriate profit level, or profitability, is very important for a firm's survival and growth.

Profitability is said to be a function of three factors (Wright, 1970):

- (1) sales volume (or work done), sometimes called turnover
- (2) the capital investment necessary to support (1), and
- (3) the margin of profit earned.

Profitability may be expressed as a profit percentage of turnover (POT) or return on capital investment (ROI). (Turnover here has the same meaning as sales volume while the return is gross profit).

Both POT and ROI have been used in studies of profitability in the construction industry. Lea &

Lansley (1975a, 1975b), and Lenard & Heathcote (1990) for instance, used the average return on turnover. Asenso & Fellows (1987), on the other hand, used two measures, (1) the pre-tax return on net assets employed, and (2) the return on (equity) shareholders investment.

One argument against the use of POT as a measure of profitability is that firms may achieve apparently high profitability primarily because of the high net asset involved. Apart from this however, there is little to choose between the two approaches, as implied by Wright's three factors above.

Wright has specifically termed ROI, or total assets less current liabilities, 'profitability', as it seems most accurately encapsulate the level of financial achievement against the long term funds committed to the business. However, the practice of subcontracting in the construction industry may not encourage firms to increase their net assets despite increases in workload. This may exaggerate construction company profitability based on net assets when compared with, for instance, manufacturing companies. As a result profit generally, in terms of excess income over expenditure, is still the most important criterion for an economic action in the construction industry today (Fellows & Langford, 1970).

Empirical studies in the field have been mainly concerned with the relationship between profitability and the size of firms (Asenso & Fellows, 1987). In some cases (Hall & Weiss, 1967; Samuel & Smith, 1968) a strong relationship has been found, in other cases (Singh & Whittington, 1968; Lea & Lansley, 1975a; Asenso & Fellows, 1987) results have been inconclusive.

Two of these studies relate specifically to the construction industry. Lea & Lansley (1975a, 1975b) examined a sample of twenty three construction firms to ascertain the effects of the extreme fall in demand for building work over a two year period ending in 1975. As a result, they were able to conclude that the management of these firms should have considered reducing their overheads rather than profit margins as a means of survival during this time. In addressing the relationship between size and profitability, They also found that:

"There was no indication that [POT] profitability depended on the size of firm ... nor indeed has there been in other studies, so that high profitability in terms of return on turnover and capital was just as accessible to the small as the large firms provided their management was good. An analysis carried out for the study showed no clear relationship between the total demand on the industry and either the total turnover or the average annual profitability of the industry as indicated by the average profitability figures available."

Asenso & Fellows' work (1987), based on the analysis of forty one firms which were classified into four groups on the basis of their net assets employed, tended to endorse Lea & Lansley's observations on the lack of relationship between profitability and size. In addition however they found that the dispersion between construction companies' profitability tended to decrease with the size of company, suggesting that the larger firms in their sample exhibited a greater stability of profitability. Also a pervasive negative trend in average profitability was found over the period under study (1975-1979, 1980-1984).

Several problems arise from these two studies that are worthy of mention. Lea & Lansley, for instance, neglected to provide any indication of the numbers of groups considered in relation to the independency of size of firms and profitability. Asenso & Fellows, on the other hand, provide no figures in support of their conclusions. Also, their sample size seems rather small for any generalisations to be made.

It is interesting to note however, that Lea and Lansley found an average POT level of 2.5 percent for the firms over the ten year period studied, but their sample size also was very small.

These results are of significance for students of

contractors' pricing strategies, a field in which the authors are currently active. The evidence above suggests that contractors may be primarily concerned with making appropriate ('normal') profits relative to their investment level and the need to satisfy associated shareholders with reasonable dividends.

Lea and Lansley (1975) identified several situations where contractors find it difficult to meet this normal profit. Low profits may be caused by low mark up values in contract bidding in order to enhance the prospects of work acquisition. Fellows and Langford (1980) found that some firms deliberately make low profits only in the short run by 'buying work' to survive in recession periods or in order to obtain further work from the same source. The problem of course is that, although this strategy may lead to long term profits, the dangers of underestimating production costs are ever-present thereby increasing the risk of failure.

The indications from previous research are that low profitability levels predominate construction contracting. This could either be intentional in the short run with the expectation of profit maximisation in the long run, or possibly due to unfamiliarity with the risks involved in contract bidding, or simply due to the effect of persistent keen competition in the industry.

Whatever the cause, the result is that a firm may not necessarily make a profit on every tender won. Paradoxically however, a firm is nevertheless expected to make adequate profits on its total annual business activities if it is to continue to remain in business.

In order to clarify the issue further, some empirical confirmation of the low profitability of construction companies is needed. The analysis described here was aimed at providing evidence of this nature together with some insights into the possible causal mechanisms involved.

Following previous approaches, the profitability of a sample of 80 construction contracting companies is examined, yearly profitability generally, and profitability classified by size of companies is considered, a critical examination is made of the business activities of 8 major contractors, and finally the profitability of 110 housebuilders is compared with that of general contractors.

DATA AND METHODOLOGY

The data for this work were obtained mainly from four sources, (1) Extel Statistical Services Limited publications of companies financial accounts (Extel

Group, 1983), (2) individual firms' annual financial profit and loss account, (3) 'Building' journal (Cooper, 1988), and (4) Inter Company Comparison (ICC) Business Ratio Ltd (1989).

The study was conducted in three parts with the aim of identifying trends in annual profitability of construction companies and relationships with the different business activities of the companies.

Part one

Part one considers the POT profitability of contractors between 1980 and 1987 inclusive, a period of economic recovery for the construction industry. The contractors for this analysis were selected at random from those whose annual financial accounts are published by Extel. A total of 120 companies were selected for analysis. As the libraries consulted maintained Extel information for only the previous five years, the information was supplemented by inspection of the prior printed annual financial accounts of the individual companies concerned.

Another problem was that some of the selected companies had either ceased trading or merged with other companies, thus preventing the collecting of a full set of records.

These were discarded from the sample leaving a total of 80 companies for analysis.

The measure of profitability used here was based on the profit level as a proportion of volume of sales, due to the relevance of turnover to construction output for each year.

Three analyses were made:

- (1) Analysis of the yearly aggregated profitability of the 80 companies.
- (2) Analysis of profitability by company size.
- (3) Analysis of company growth in turnover.

Part two

As the results of these analyses indicated that very low profitability levels are obtained generally, the need for an adequate dividend for shareholders suggested that other related business activities may be providing relatively higher returns than pure contracting. This proposition is examined in part two by considering some of the other business activities of the firms involved. This involved the study of eight of the very large companies in the sample over the years 1986 and 1987 from Extel and 'Building' data sources. This has been supplemented with analysis of housebuilding profit margin published by ICC Business Ratio Ltd.

Part three

Part three describes the analysis of the POT profitability of housebuilders between 1986 and 1988. This is based on the profit margins of 110 housebuilders published by ICC Ltd. This analysis considered aggregate profitability, with respect to company size, for companies in the housebuilding sector for comparison with general contractors. The main aim is to corroborate the results found in part two in that housebuilding work was generally a profitability enhancing activity for most construction firms over the period.

RESULTS OF PART ONE

Annual profitability

The mean and standard deviation annual profitability as a percentage of turnover from 1980 to 1987 are shown in Table 1, the grand mean for the period being 3.23 (3.76 standard deviation). Clearly the differences in means between years are not great. A one way ANOVA confirms this ($F=1.36$, $df=7$, $p=0.22$). Cochran's ($C=0.22$, $p=0.000$)

and Bartlett-Box's test ($F=6.85$, $p=0.000$) indicate significant differences in standard deviations, however.

A negative correlation of standard deviation with mean profitability, ($r=0.85$, $df=7$, $p=0.008$) suggests a greater consistency at higher profitability levels.

Analysis of company size and profitability

The reported annual turnover of the companies were deflated by rebasing to 1980 by the standard retail price index and plotted against the profitability achieved (Figure 1). No clear trend is observable except that the spread of profitability levels seems to reduce with increasing size of companies. In fact a significant positive correlation of 0.084 ($p=0.017$) was found, indicating mean profitability to be higher for larger companies. Dividing the companies into three size groupings of up to £11m, £11-45m and over £45m gave reducing standard deviations of 4.80, 3.60, and 2.08 respectively (Cochran's $C=0.5723$, $p=0.000$; Bartlett-Box $F=65.9$, $p=0.000$).

Simultaneous analysis of company size and annual profitability

A two way ANOVA (covariance) produced F ratios of 4.92 ($p=0.027$) and 1.41 ($p=0.199$) for the effects of company

size and year respectively, indicating only company size to be significantly and positively correlated with mean profitability, confirming the above results.

Discussion

The lack of any significant difference between the yearly mean profitability of the companies studied is surprising in view of the well known trends in cost and price movements that occurred during this period. This period, starting from 1980, witnessed an annual increment rate of 6.3 percent in building cost levels compared with 3.3 percent equivalent increment in tender price index. With this particularly dramatic discrepancy between published cost and price indices in the early years of the period, significant changes in profitability were confidently expected over the years involved.

There is however, on reflection, some evidence that construction company POT profitability has always been around 3 percent. Lea and Lansley (1975) found a 2.5 percent POT average for the period of ten years studied by them (1960-1970). In the USA, Park's (1966) study of the pre-tax profit of 39,000 contracting firms produced an average of 3.5 percent. Other UK studies (Llewellyn,

1973; Burgess, 1973) found 2.5 percent POT to be the average for construction industry. Thus profitability in the construction industry, seems to have been hovering around 3 percent (Flanagan, 1990) irrespective of the state of the market.

Rather less of a surprise is the generally low level of profitability achieved by contracting companies, probably a result of the high levels of competition involved in competitive tendering. Southwell (1970), Lea and Lansley (1975), Fellows and Langford (1980), Beeston (1982), Raftery (1987), Lenard and Heathcote (1990) and many others have remarked on the role of keen competition in forcing contractors to apply low mark up values in order to obtain work and maintain a share of the market. Although mark up and profitability are manifestly not the same (mark up may often be regarded as a prior estimate of profitability), it is, nevertheless, reasonable to assume that the two are at least positively correlated. In which case increased competition should result in lower profitability, as predicted by standard economic theory.

Cooper (1988) suggests that the diminution of overseas contract opportunities has made domestic market more competitive. The expectation therefore is a reduction in profitability, manifestly lacking in these data.

All construction projects involve elements of risk which affect potential gains or losses to contractors. Such risks are covered in project selection decisions by either analytical or subjective assessments (Wolf and Kalley, 1983) and later in the form of contingency amounts included in bids (Artlo, 1986). Of course when these risks fail to materialise, the contingency converts to profit. In management contracting, as the client carries most of the contractual liability for risks, the potential for contractor contingency-profit conversion is limited, an argument that may have been intended by Cooper as one of the reasons for the low profitability of 'most' construction firms involved in management contracting today. Management contracting does not appear to be an expanding field as one would be made to believe however, recent surveys (Morrison, 1986a, 1986b, 1989) finding only 1 to 3 percent of contracts being let on this basis.

Spedding (1977) suggests that low profitability may be due partly to resource forecasting inaccuracies and cost recovery shortfalls, both being related to the high levels of uncertainty in the industry, making contractors' pricing something of a gamble. Thus the reason that larger companies are more profitable may be that large firms are generally more efficient and better

organised than small firms in their management strategies while at the same time better off in potentially low profitability situations (cf., Lea and Lansley, 1975). It is also possible that larger firms have better defined pricing policies and objectives together with well diversified business activities.

The finding that variability between company profitability levels decreases with increasing company size is consistent with those of Asenso & Fellows (1987).

This tends to suggest that larger companies are more consistent and similar to each other than smaller companies in terms of estimating, pricing and production.

This may be because of the increased level of competition or market awareness among larger contractors which, together with low margins generally, restricts the potential for viable alternatives.

Growth in size of firms and turnover

Table 2 shows the turnover growth index compared with annual average profitability. Despite increases in turnover between 1983 and 1987 as indicated by the growth index, profitability was relatively decreasing (a negative relationship), implying that increases in industry work load do not necessarily guarantee higher profitability.

Conclusions

The following conclusions were drawn in respect of the analysis in part one:

- (1) Construction company POT profitability was generally quite small (around 3.2 percent).
- (2) There was no significant changes in POT profitability over the years 1980-7.
- (3) There was a positive correlation between POT profitability and size of company.
- (4) The variability of POT profitability between companies was negatively correlated with company size, suggesting that larger companies were more consistent and similar to each other than smaller companies in terms of estimating, pricing or production.
- (5) There is no evidence of any positive relationship between changes in turnover and POT profitability, thus a firm's growth does not necessarily ensure higher profitability.

RESULTS OF PART TWO

So far it has been established that company size is important in terms of the expected POT profitability.

The average profitability of the eighty construction firms studied between 1980 and 1987 was 3.2 percent. Compared with other industries, this may be considered to be rather low, especially as this 3.2 percent is a pre-tax profit margin.

In classical economic theory, it is generally assumed that individuals/firms try to maximise profits in the long run. If returns on capital are low in construction work, then investors should be attracted away from construction into other more profitable industries. Nevertheless, the industry does continue to attract new investment, as evidenced by the increasing number of company registrations. Between 1980 and 1987 the registration of private construction contractors increased by 54 per cent (HMSO, 1988) while average profitability remained generally constant.

One possible reason for this is that firms are really making more profit margin than the statistics reveal. Companies may be deliberately reporting low profits in order to reduce tax, or firms are engaged in other business activities (construction related or otherwise) that generate additional profits to supplement low construction profits. Thus contracting work may be used to set off tax against other business activities. This would go some way to explaining why larger firms produce

higher profitability than smaller firms, as larger firms are known to have a bigger investment base and therefore a greater capability of investment in other activities.

This notion prompted an analysis of the business activities of larger firms. A sub sample of eight out of the twenty two very large firms identified in part one were selected for analysis of years 1986-7, data being derived from 'Building' (Cooper, 1988) and cross checked with the annual financial accounts of companies involved.

The total turnover of these eight companies for the two years under study was £7.50bn and £8.72bn respectively, constituting at least 15 percent of the whole of Great Britain construction output for these years, a huge proportion of the industry's output considering that 74,948 and 75,810 companies registered as either building contractors, building and civil engineering contractors or purely civil engineering contractors in 1986 and 1987 respectively (HMSO, 1988).

Five analyses were made:

- (1) The types of business activities carried out.
- (2) Annual POT profitability of the firms by individual business type.
- (3) Contribution of each business type to total annual

turnover.

(4)Contribution of each business type to total annual profitability.

(5)The disparities in profitability between business types.

The aim of these analyses was to show that while construction firms may achieve only low profitability for their primary activity, some have diversified into other profitable ventures or construction related activities that compensate for this low margin.

Types of business activities of construction firms

The eight construction firms were involved in business activities that broadly classify into three sectors:

(1)Housebuilding construction

(2)General building and civil engineering construction contracting

(3)Other construction related activities.

Table 3 summarises the activities comprising sector (3) and the number of firms involved in each.

The market structure for housebuilding is quite different to that for general contracting. General contracting work is mostly procured by government, private firms, corporations, and groups of individuals. Housebuilding on the other hand is often procured by individuals.

Other construction related activities are either in the form of procurement or supportive services for housebuilding or general contracting.

During the period between 1985 and 1987, housing construction was booming while the general contracting market was rather depressed (Cooper, 1989), which may have encouraged firms divert more resources into housebuilding. The market position has since changed and commercial and industrial building (property development) has boomed instead. Cooper (1989) reporting on an analysis of twelve top construction firms found new house sales to be down by 30 percent in 1988, work having stopped on some sites, probably due to rising mortgage interest rate.

The difference in housebuilding market structure could well reflect on profitability in this sector, which has been consistently high. CIBS Securities Europe claim that despite the low housebuilding rate and the then boom

in commercial and industrial work, a turnover of £100m in housing meant £25m in profits, whilst design and build contracts (the basis for most speculative commercial and industrial buildings) make only £4m on the same turnover (Cooper, 1989).

Profitability and business types

The POT profitability of these firms on all their business activities put together was 6 percent (1.87 standard deviation) and 6.78 percent (2.36 standard deviation) in 1986 and 1987 respectively. These are clearly well above the 3.45 percent recorded for general contracting work for this company size between 1980 and 1987. The question is "What other activities could be responsible for this increase in margin?" This necessitate the analysis of turnover for these three business types involved.

Table 4 shows the POT profitability of the three business types, indicating that other construction related activities and housebuilding generated a much higher profitability than general contracting. Caution should be taken here as this can only be confirmed by the proportion of total turnover that gives these turnover values.

A multivariate analysis of variance (MANOVA) was undertaken to determine the importance of business type ($F=11.76$, $df=2$, $p=0.000$), the contractors involved ($F=0.93$, $df=7$, $p=0.496$), and the business year ($F=0.24$, $df=1$, $p=0.631$) as factors associated with the changes in profitability, with only business type showing the required statistical significance. Thus, after removing the (significant) business type effects, neither differences between companies nor differences between years could be treated as any other than simple sampling effects.

Contributions of business type to total annual profit and turnover

The contribution of business type to total annual profit and turnover is summarised in Table 5 for 1986 and 1987.

Despite the contracting works contribution of 56 percent average POT, the contribution to profit was the least (23 percent on average). Housebuilding activities contributed the least to turnover and highest to profit.

Other construction related activities competed keenly with housebuilding. This suggests that general contracting work supplied most of the finance for the other activities of the firms but the most profit was made from housebuilding and other construction related work.

RESULTS OF PART THREE

The fact that speculative housebuilding generally produced a higher profit margin is not peculiar to the eight top firms analyzed in part two. This high profitability is corroborated by our analysis of profit margin of 110 firms engaged in housebuilding in UK published by ICC Business Ratio Limited. This statistical analysis covered 1986 to 1988.

Profitability in relation to company housebuilding size

The aggregated annual company profitability over the three years was 12.55 percent (7.79 standard deviation).

A two-way ANOVA (covariance) indicated significant differences in profitability between years ($F=17.604$, $df=2$, $p=0.000$) but not between firm size ($F=0.002$, $df=1$, $p=0.97$). The companies' turnovers on housebuilding (used here as a measure of company size) were divided into three equal size groupings on the basis of 1980 rebased turnover as in our previous analysis. This showed that the small firms in the sample, ie., firms with low speculative housebuilding activity, had the largest profitability spread generally over the period. The analysis on a yearly basis (Table 6) shows standard deviations decreasing with firms size generally.

Growth in turnover and relationship with profit margin

This period witnessed growth in turnover with respect to housebuilding as shown in changes in the grouping turnover in the attempt made to make the grouping of equal sizes for the purpose of statistical analysis (Table 6). The turnover over this period is positively correlated with the profit margin ($t=16.34$, $df=2$, $p=0.039$).

Explanations for this trend

The major result of interest here is the much greater levels of profitability found in the housebuilding sector (mean 12.55 percent) than those found in general contracting (mean 3.23 percent).

Housebuilding is highly differentiated from general contracting in terms of capital outlay, market structure, level of competition, cash flow profile, pricing policies and costs. Any or all of these could be responsible for the different profitability levels in housebuilding and contracting work. The same argument applies to property development and investment which tend to have the same attributes as housebuilding. On the other hand, although construction contracting is not generally capital

intensive (Hillebrandt, 1990), a huge proportion of profitability in housebuilding could be in the form of return on capital tied up in resources, for example land, finance etc, required of speculative housing procurement or the proceeds from the demand and supply equations for speculative housebuilding.

Also, it would seem that speculative residential work has a greater potential for profit for all concerned than work in other sectors, perhaps due to the more quantifiable nature of the market price and likely returns. Leopold and Bishop (1983) concluded that profit from housebuilding comes from two sources - market price which includes mark-up on cost of production and additional mark-up on development gain. Lenard and Heathcote's (1990) analysis also supports the notion that high profit margins on speculative housebuilding are based purely on economic considerations rather than the nature of work involved.

Another possibility is that the intensity of competition is less for residential than other types of work. A survey by Niss (1965) found that most housebuilders and general contractors used fixed and variable mark up policies respectively - variable mark up policies depending on the number of competitors involved (average 3.6 and 7.0 percent for housebuilding and general

contracting respectively) which in turn were found to depend on current market conditions, a function of the demand for construction work generally. These differences suggest general contracting to be more competitive than housebuilding, which may be forcing general contractors into strategic market oriented pricing manoeuvres in order to survive.

Risk level is another underlying factor. Obviously, in speculative housebuilding and property developments, firms are known to act as both client and contractor, hence, do not have opportunity to distribute the risk involved to other parties. On the other hand, contracting risks, at least, are shared by clients and contractors. However, general contracts are known to be large in terms of size (contract sum) than housebuilding while they are mainly of a one-off nature. Housebuilding is usually repetitive (prototypes on the same or different sites), resulting in the advantages of learning effects. However, any mistake made on contracting work could have far reaching effects on the annual profitability of a firm, as a project could represent a sizeable proportion of a firm's annual turnover, while a similar mistake on housebuilding could be corrected on the subsequent prototypes.

The constancy of profit margin of the 80 contractors over

the period of study suggests a similar conclusion to Niss, ie., increased intensity of competition results in less profitability, although it is doubtful that the level of competition remained the same throughout the period examined in this study. In this case other factors, especially the diversification strategies discussed above, seem to have combined with competition and demand to produce the effects observed. As a strategy for profitability enhancement, diversification may be more easily accomplished by larger firms with huge positive cash flows (Hillebrandt, 1990). Figure 2 gives a picture of the large construction firms activities to offset the risk of being subjected to ups and downs of construction market. This supports the comment made by the chief executive of one of the top construction firms in UK that "one of the beauties of his firm being a large construction firm and having a lot of activities is the opportunity to move resources around to high profit construction related ventures".

The increased consistency of profitability for larger general contracting companies is also evident among these housebuilders, suggesting both company size **and** activity to be associated factors. What is difficult to explain however is the difference in the impact of the factors on mean profitability levels - company size being significant and yearly trends (1980-7) insignificant in

general contracting, with yearly trends (1986-8) significant and company size insignificant in housebuilding. It is likely that the recent housing 'boom' may be an influencing factor.

Summary and conclusion

The analysis described in this paper indicated the existence of a positive correlation between the size and POT profitability of the construction companies in the sample. After removing this effect, and contrary to expectations, average profitability was not found to change significantly from year to year. Evidence was also found to suggest that larger contractors were more consistent in their profitability levels.

Investigation of the possible reasons for differences in profitability between companies showed the degree and type of diversification into different activities, particularly housebuilding, to be major factors associated with enhanced profitability.

The apparent stability of profitability at about 3 percent POT per annum found in this, and other similar studies, suggests the presence of some underlying homeostatic mechanism of which diversification may be a part.

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Table 1 Profitability of 80 construction firms (1980-1987)

YEAR TOTAL ANNUAL TURNOVER £	PROFIT MARGIN %	STANDARD DEVIATION
1980 7,339,224	3.22	3.58
1981 7,672,322	3.54	3.52
1982 8,256,793	4.07	2.82
1983 9,722,792	3.37	3.56
1984 10,552,146	3.25	3.57
1985 11,154,121	2.74	3.74
1986 11,640,869	2.52	4.84
1987 13,166,791	3.12	4.37
Average	3.23	3.76

Table 2 Relationship between the turnover growth and profit level

	1980	1981	1982	1983	1984	1985	1986
1987							
TURNOVER GROWTH INDEX (at 1980 prices)- Turngrow 118	100	93	92	103	107	105	106
AVERAGE PROFIT MARGIN (%) - Profcent 2.52 3.12	3.22	3.54	4.07	3.37	3.20	2.74	

Turngrow = 138.1 - 10.89 Profcent

R= 0.622

F value=3.786, P=0.099

Table 3 Construction related activities of a sub-sample of 8 very large construction firms

of Firms	Other Construction Related	Number
	Activities	
	Scaffolding	1
	Building Services including Mechanical and Electrical Engineering	2
	Property Development and Investment	7
	Mining	1
	Quarry Products	1
	Building Materials	1
	Industrial Products	1

Table 4 Profitability by work type

Work Type	1986	SD	1987
	Mean		Mean
SD			
Housebuilding	12.19	4.36	13.21
3.85			
Building and Civil			
Engineering Works	3.41	1.09	3.32
1.03			
Construction Related			
Works	17.69	12.22	20.68
16.73			

SD - standard deviation

Table 5 Profit and turnover contributions by work type

Type of Work Turnover	% of Total Profit		% of Total
	1986	1987	1986
1987			
Housebuilding 19.24	36.77	40.00	17.95
Building and Civil Engineering Works 56.30	25.88	20.60	56.62
Construction Related Works 21.00	35.20	37.85	22.00

Table 6 Statistical analysis of housebuilding profit margin by year

Group	Count	Mean	Standard deviation
Turnover (£M)			

1986			
Less than 8.5	38	10.24	8.38
8.5 - 18.5	38	8.81	4.25
Over 18.5	34	10.70	6.29
Overall Total	110	9.88	6.53
Cochran's C	= 0.55	(p=0.002)	
Bartlett-Box F	= 7.91	(p=0.000)	

1987			
Less than 10	35	11.03	8.88
10 - 20	38	10.67	6.65
Over 20	37	14.19	6.08
Overall Total	110	11.97	7.37
Cochran's C	= 0.49	(p=0.025)	
Bartlett-Box F	= 2.81	(p=0.059)	

1988			
Less than 12.5	37	15.53	10.41
12.5 - 22.5	33	14.65	8.29
Over 22.5	40	16.97	5.56
Overall Total	110	15.79	8.25
Cochran's C	= 0.52	(p=0.008)	
Bartlett-Box F	= 6.96	(p=0.001)	
