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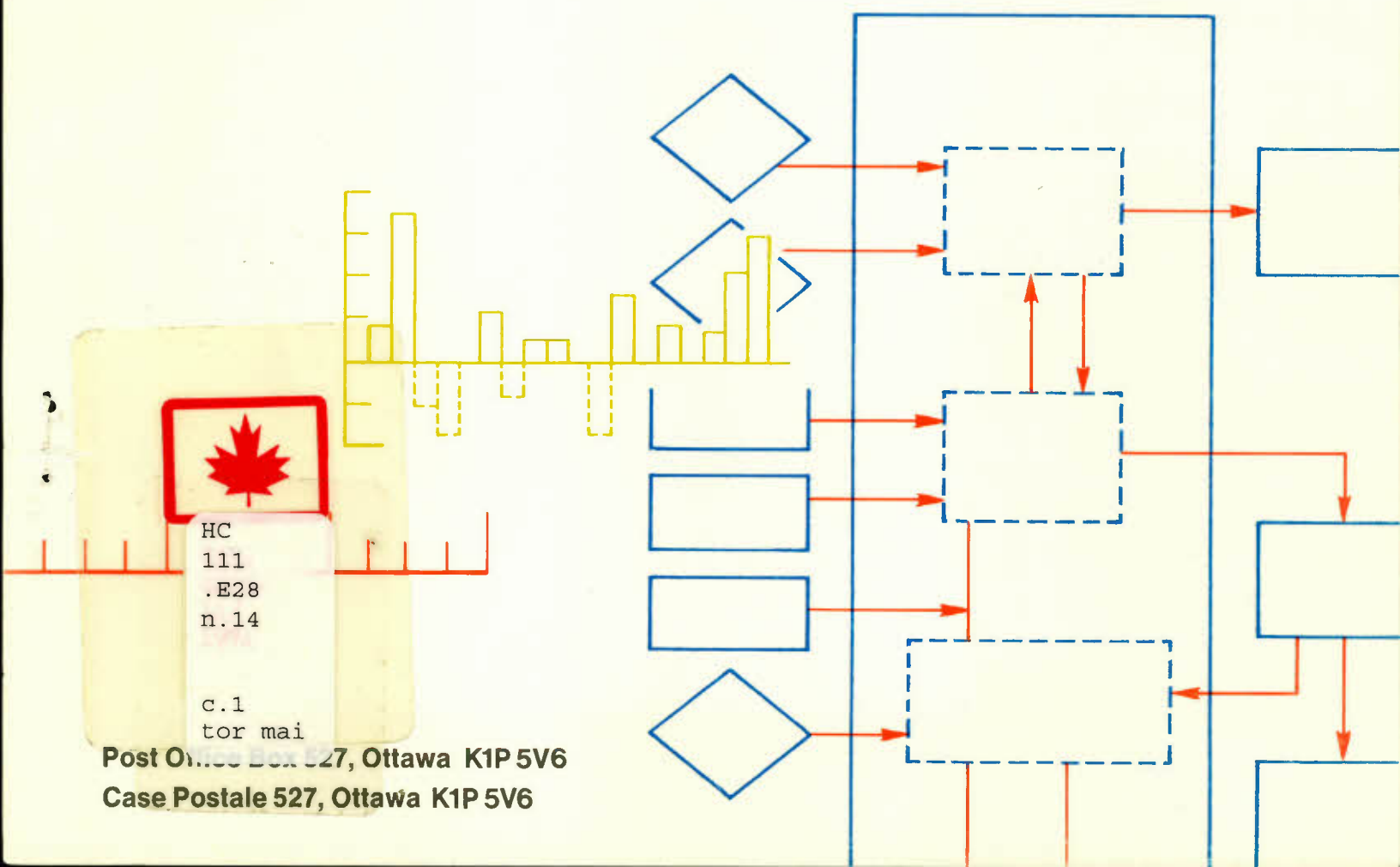

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DISCUSSION PAPER NO. 14

The Industrial Organization Dimensions of Cycles in the Construction Industry

by W. F. Barnicke

October 1974

Summary

The author explores the impact of the industrial structure and certain conduct practices on the degree of cyclical instability of this industry's activity. In the course of the enquiry the patterns of and justifications for the unique vertical integration among construction firms were studied. This pattern, with its many firms of various sizes and specialties amalgamating in temporary and everchanging relationships, provides for a very adaptable and flexible allocation of resources to meet the complex and variable demands for the services of the relevant inputs. However, this pattern also is coincident with a substantial element of risk and insecurity which is shifted around by a series of legal and procedural practices, e.g., mechanics' liens and surety bonds. In the end, however, the construction firms seem to bear the strongest impact of this risk, so their attempt to minimize it in their corporate financial structures and elsewhere, including requests for government aid are quite understandable.

The author seeks to identify possible ways in which firms can influence the rate of flow of demand for construction firms and finds none that are, or can be, effective for this purpose.

The study also examines the often heard proposition that bankruptcy is excessively high in construction and concludes that this feature has often been overrated, both in its incidence and in its impact.

A review is also made of existing data on the small business in construction. A proposal to control entry is reviewed, but unsupported, in spite of evidence of low profitability in such small firms.

TABLE OF CONTENTS

PREFACE

This study was undertaken at the request of the Economic Council of Canada during the period May 1972 to July 1973. It was part of a total referral research project related to the instability, especially cyclical instability, in the Canadian construction industry. Specifically, these terms of reference were as follows:

> "With a view to increasing the productivity and efficiency of the Canadian economy, the study should bear on:
>
> (a) the place occupied by the construction industry in the economy and the effects on the whole economy resulting from changes in this industry sector;
>
> (b) the consequences of changes in economic activity, particularly cyclical phenomena, upon this industry, including its ability to meet urban needs;
>
> (c) to impact of Government policies on the stability of the construction industry.
>
> This study should provide the Economic Council of Canada with the data necessary to recommend such action as may be deemed desirable for reducing instability in the construction industry."

It is clear from these guidelines that the cyclical phenomena gained a preferred position. Implicit in them was an hypothesis that the cycle was important to the economy as a whole, to the provision of social welfare, and to the industry's participants (labour and capital). Accordingly, a series of research projects was commissioned to examine both microeconomic and macroeconomic dimensions of the problem. Thus the roles of governments and other macroeconomic demand phenomena were studied as the most

prominent area of research. However, potential for legitimate and significant findings also existed in areas of housing and urban needs, technology, business management, financial flows, labour markets and labour unions, productivity and inflation, and of course industrial organization. Studies in these other areas, ten in all, have been carried out by competent researchers, most of whom operated from offices in Ottawa. This conglomeration of researchers interested in the same problem proved to be a most valuable resource. It should soon produce a series of specialized staff reports and a final, formal report by the Economic Council of Canada.

The terms of reference related to the industrial organization study of the construction industry were purposefully constraining. The defined interest was the construction cycle and other dimensions of instability. This generally precluded several interesting areas of research, but it also enabled some concentrated effort on the phenomenon of cycles as they interrelate with industrial structure. As the literature survey shows, it is an area of research that is now considered obsolete for major purposes. However, as is shown in this study, construction is an industry with a very special constellation of influences. Standard industry analysis, of several orientations, is not easily transferable here. Therefore, where cyclical phenomena are predominant a renewed interest in the research area was most legitimate.

The findings of the study are such that they do not lead to proposals for positive changes in policy or

structure. Basically the study has concluded that the cycle and the industrial organization of the construction industry are almost completely unrelated to each other. The cycle has not dominated the influences on the structure nor has the structure modified the cycle. This finding contradicts the expectations of many to whom I talked about the issues, but I now feel that these expectations were based on insufficient specific analysis. After a year of thinking about it I hold to the expectation that I sensed the second, but not the first, time I gave the question some consideration. The research confirms my second sense.

The study has three separate tones to it. Clear research, pedagogic discussion, and a debating stance are all present. Each has its own role. Research was needed since little had been done and a groundwork is essential. Pedagogy was needed because there were insights learned which should be transmitted to those persons who will later study the industry and administer social policies related to it. Debate was needed because I felt that some with whom I came in contact were locked into traditional stances about the industry and the causes and effects of the cycle. Some were locked into policy prescriptions that, upon review, offered no operational hope of solution. The context of the Reference sets the boundaries of the topics and the expected long-run readership mix set the several modes of presentation.

I should like to express specific appreciation for my colleagues generosity in assisting me with discussion and text readings. Neil Swan was the most

persistent, patient, and perceptive. B. A. Keys, P. Laverty and M. R. Prentis also spent welcome sessions of intellectual interchange trying to interpret and improve my evolving thought and work. Peter Yao, my research assistant, prepared many tables, read many books, and pointed out many poor manners of expression on my part. Other colleagues contributed to lesser degrees, including R. A. Jenness, D. Angus, D. Caskie, and, on three occasions, the Council Chairman A. Raynauld. And of course W. E. Haviland, the Reference Director, was quite valuable too, especially in hiring me and selecting my specific terms of reference. Their responsibility for errors or misinterpretation is non-existent of course.

Ottawa
August 1, 1973

CHAPTER 1

GENERAL INTRODUCTION

This is a study of the industrial organization of the Canadian construction industry. It is an industry with a dominant and important role in the economy. It has a large number of firms ranging over extensive spectra of sizes and of specialties.

The prime interest of the study is the inter-relationships between the construction cycle and the way the industry is organized. Special concentration on the reasons for an everrearranging pattern of vertical integration is done because this ends up as the most interesting and the most important phenomenon.

Chapter 2 discusses the framework of reference for the project. The specific economic meaning of industrial organization is discussed as an opener. Secondly the size and position and several dimensions of the construction industry are outlined to give some relevant perspective. A survey of the related economic literature on the subject area and the industry provide the intellectual backdrop. Definitional points on dimensions of the demand and supply qualities are set out for comprehension. The industry, a very heterogeous collection of firms, is defined so that the boundaries of the subject can be identified. Reference is also made to the relevant market scope in a geographical sense because it is quite important in interpretation. Finally, Chapter 1 closes with a

presentation of the policy problems to be analysed because this is policy oriented research with permission for prescriptive proposals explicitly in the intention of the Economic Council.

Chapter 3 discusses the general or overall structural features of interest. The vertical integration, the way firms in several stages of production interact, is the main subject of concern. It is interpreted in terms of the theory of firms, their formation and the reasons for them. This is an area of only recently renewed interest to theoretical economists. Possibly this is a first recent empirical case study of this theory. What emerges is that few of the reasons that would explain an economically rational, vertically integrated firm exist in the context of construction. Rather the conditions for persistent disintegration obtain. Thus the contract system is the form of vertical integration, and it is an effervescent form which clearly dominates the industry for very comprehensible, economic reasons. The cycle is then raised, both as it affects and as it is affected by the basic structure to the industry. Here a debating stance is taken to show why those who propose the interaction between the cycle and the structure is strong have failed to grasp some basic technical and economic facts as they apply in the construction industry. Some comments are made on the concept of "capacity" for a firm as an illustration of the inapplicability of unmodified standard theory.

Chapter 4 gets down to the specific analysis of subsectors of the industry. Concentration data and certain operational characteristics are compared by size of firm, region, and technical specialty. Four separate groups are analysed. The peculiar problems of the small proprietorship are reviewed and a very "unprofitable" situation is found. Foreign ownership gets a brief treatment here too. Interesting data, in a conceptual sense, on the change of size of firms from year to year leads mostly to a proposal for better quality data on the internal flux of the construction industry. This chapter also examines the concept of entry barriers but does not yeild industry wide estimates of size because such do not exist conceptually. The final section of the chapter is a long review of the bankruptcy problem in the industry, a problem all too often misunderstood in several ways. Among other things, it is reported that the cycle is not the dominant cause of bankruptcy. Policy indications are made throughout this chapter.

Chapter 5 sets out to review some elements of conduct, but because of the impotence of the industry to modify demand or output, as analysed in Chapter 3, only partial discussion is presented on what most economists treat as conduct variables. Risk shifting and reducing activity, especially performance bonds and mechanics' liens, get more extensive treatment because they are subjects of extensive concern to many industry people and analysts.

Chapter 6 closes up the main text with some brief additional discussion of the cycle and the structure. The policy orientation of "laissez-faire" is adopted because the research leads to no other. However, the distributional problem of the "low incomes" of the smallest firms is considered. A proposal to affect this is presented but not accepted, although further consideration is suggested.

The Appendices review the current and past data sources. The main suggestion is to congratulate Statistics Canada for the quality of current data on structural features, although it is only a very recently achieved status for the data. A very esoteric appendix discussing the potential for double counting in the data is included as a background item. Finally, a bibliography is presented.

The study set out with a specific purpose. As in all research, one hopes for strong results indicating positive action. Most of this study's results call for "laissez-faire" policies in terms of altering the structure to influence the cycle. It is important to know when to keep hands off. Policy activists are only useful when an active policy can do something besides keeping policy people busy.

CHAPTER 2

THE GENERAL CONTEXT

2.1 The Industrial Organization Context

The branch of economics, known as industrial organization, studies the relationships among three classes of economic characteristics: (1) structural features of the markets, (2) patterns of behaviour and market conduct, and (3) economic performance. It is sometimes described as applied price theory because it is really the empirical examination of theoretical constructs such as perfect competition, monopolistic competition, oligopoly and monopoly. Usually its orientation has been strongly affected by policy matters, especially those behind the antitrust or competition laws, but the work on utilities and market support mechanisms can be properly included within the domain of industrial organization.

Industrial organization, as a branch of economics, has to be distinguished from the study of management or production organization. The former studies the way firms as collective entities of management, labour and capital organize themselves. The latter studies the ways to organize these three basic inputs within the context of a firm. Economics emphasizes the efficiency of the collective system while management studies emphasize the efficiency of the individual producer in the system. The two uses of the term industrial organization are compatible yet distinct. This study is done in the context of economics.

This area of economic research became relevant because of the observed divergence in market structures, each of which seemed related to a variety of factors. Economic theory has long postulated "perfect competition" as an ideal structure to provide society with its wants efficiently, but such structures have not predominated in fact. Sometimes the deviation was due to economies of scale and relative market size, but sometimes other causes could be found such as predatory tactics, patents, collusion, etc. Many feared that the long-run trend, was away from the ideal toward greater monopolization and the concommitant greater deviations from the goal of optimum social welfare. The price would be paid in terms of resource misallocation, quality deficiencies, slow techonological progress, inefficient capacity utilization, etc. At least the theory postulated these things, and it fell to the economic researcher to test his ideas on reality. As a consequence, studies abound on the role of structures and conduct that may encourage or cause distortions from the ideal market results, or more correctly, the ideal package of results.

Throughout the extensive research, the particular performance criteria of "stability" has largely been ignored as a concern. Economists using classical models had believed that there was a self-correcting system wherein flexibility was a crucial component. Thus, the notion of "instability" as a problem was not given much attention. Output flexibility was as important to the system as other types of flexibility, and those who felt hard done by when prices, or technology, or output shifted were considered to be unfortunate, not because of their suffering, but because they did not understand the model and their role in its operation. Eventually

the Great Depression of the 1930's raised a lot of questioning of the economists' models, some of it quite profound. The built-in correcting mechanisms had been failing, and as a result flexibility that was supposed to help remove concentrations of economic power, became a vital symptom of the Great Problem. Justifiably these market structures began to receive attention as influences on the Great Failure. In the late Thirties and again in the early Fifties, specific questions were asked about the relationship between market structure and output stability. However, macroeconomics with its new models, new techniques, and greater policy impact received all the attention when questions of output stability were raised, leaving market structure and conduct as ignored elements.

As a result of all this, there has been very little research and very little literature on the specific questions relating the elements of industrial organization (i.e., market structure and market conduct) and output stability. This study must then be, in some ways, renewed pioneering. A concise historical review is included here, but it only serves that minor role, unfortunately, and is not a good launching pad for the task at hand.

This study examines Canada's construction industry in the context of industrial organization as known to the economics profession. The purpose is to try to find any linkages that may exist between the structure of the industry, i.e., the way in which firms are organized to deal with their markets and with each other, and the way in which output flows are irregular or unstable. In general,

the author concludes that it is a flexible and basically efficient organizational pattern given the peculiar elements of demand and technology.

2.2 The Construction Industry in the Economy

The construction industry is a major one in the economy. Just what and how large its role is should be noted so that some perspective can be gained.[1/]

The product of the construction industry is the activity of constructing but the outcome is an immobile, durable, capital good. Most of it becomes vital to the social and economic infrastructure.

In size the construction industry provided about $17 billion to the 1972 Canadian G.N.P., that is about 17 per cent. As a portion of Gross Domestic Product it held about 8 per cent, a value about one-third as large as all manufacturing. Construction took about 60 per cent of the 1972 total capital investment expenditures. In 1972 about 6 per cent of the nation's labour force was employed in construction. What this adds up to is a very significant piece of the Canadian pie.

[1/] This is a very concise summary of a draft chapter to be inserted in the final Report of the Reference on Construction Instability, forthcoming. That chapter was prepared by Dr. W. E. Haviland, the Research Director of the whole Reference.

Construction can be examined under many subheads of expenditure type. The most common divisions and the percentage values for them in 1972 were as follows: 1) New Construction (84%); Repair Construction (16%) 2) Private Sector (64%); Public Sector (36%) 3) Non-residential (70%); Residential (30%). These values can be subdivided of course to examine regional divisions, contract/"own account" divisions, specific purchaser groups, etc. While this is not done here the net effect of any elaboration is to show that the demand for construction arises in both an heterogeneous and a ubiquitous way. It is a cliché, but true, to say that construction supports the economy.

The other main feature of this industry, and its most important feature in terms of this study and the whole Reference, is its cyclical instability. That is, the industry's expenditure path through time has been quite irregular. Year to year changes have averaged 7.5 per cent in the period 1951 to 1970, with a maximum being an 18.6 per cent change between 1956 and 1955. It is more irregular than most other industries, a factor which has a variety of impacts and implications, all of which are the subject of the whole Reference. The following table illustrates the deviations over the last two decades. It is this environment which has caused the industry extensive concern. Also, because it has importance for the provision of public facilities, housing, and the general growth of the rest of the economy it has been a matter for government concern.

TABLE 2.1

CONSTRUCTION INDUSTRY INSTABILITY

Year	Value of Construction (Current $ Billions)	Year to Year Per Cent Change	Per cent Deviation From Trend*
1951	3.65		-16.62
1952	4.28	17.18	- 8.64
1953	4.74	10.76	- 1.02
1954	4.86	2.69	- 1.51
1955	5.50	12.96	2.94
1956	6.52	18.58	10.74
1957	7.12	9.24	14.13
1958	7.22	1.36	12.47
1959	7.16	- 0.76	7.50
1960	6.95	- 2.91	- 1.06
1961	7.09	- 1.93	- 2.30
1962	7.34	3.62	- 3.53
1963	7.71	5.05	- 5.92
1964	8.60	11.44	- 1.19
1965	9.93	15.48	1.39
1966	11.24	13.17	2.34
1967	11.62	3.42	- 0.65
1968	12.21	5.10	- 0.79
1969	13.21	8.13	- 2.07
1970	13.78	4.34	- 6.20
1971	15.65	13.54	
Average		7.52	5.15

* Log linear trend used with growth rate of 4.52 per cent resulting.

The items of direct interest to this research study evolve not from the size of the industry but from the quantitative nature of demand, the irregular changes in demand flows, and the structure of the industry. The general causes of these irregularities are the subject of other companion studies, as are the possible general remedial solutions. The immediately important points are specified more in subsequent sections.

2.3 Survey of Economic Literature

In a very recent review of the status of the industrial organization branch of economics, James W. McKie states, "Less is known about the relation between market structure and other norms -- notably progressiveness -- and hardly anything about the effect of market structure on aggregate (macroeconomic) stability".[2/] Frederic M. Scherer has said that knowledge on the relationships between market structure and the stability of investment requires one to"... venture into the darkest terra incognita of industrial organization analysis..."[3/] While this position is essentially true, some things are known and a very brief summary can prove useful as a guide. It is to be kept in mind that the stability of output is inevitably linked with the stability of both prices and employment, and this later route to output instability will be noted first. Secondly the effects of market structure on investment instability will be noted since investment swings can affect aggregate output swings. Thirdly, the possibility that some structural features are influenced by the degree of instability must be considered.

Prices and Output

Initial interest in the relationships between market power and "instability" came in the Great Depression of

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[2/] J. W. McKie, "Industrial Organization: Boxing the Compass", in V. R. Fuchs, (ed.), Policy Issues and Research Opportunities in Industrial Organization, New York: National Bureau of Economic Research, 1972, p.3.

[3/] F. M. Scherer, "Market Structure and the Stability of Investment", American Economic Review, 59:2, May 1969, pp. 72-79.

the 1930's.[4] It was observed that certain industries reduced output and employment while holding prices quite stable. These particular industries seemed to hold substantial power in their respective markets, especially the heavy goods producers. Theory held that price flexibility should have been observed, and, with these lower prices some output expansion, or at least less output reduction, should have arisen. However, theory and observed behaviour were in contradiction. In response a series of new theories and empirical research took aim at the price instabilities and the "imperfect" market structures of oligopoly and monopolistic competition. Professional economists of all levels will be familiar with the theories because they form much of undergraduate price theory training, but the empirical evidence will be less well known both because its results were often weak and because other matters have attracted professional attention.

In 1934 Gardiner C. Means, using a very small sample of 37 industries, found a moderate correlation between four firm concentration ratios and price changes between 1929 and 1933.[5] W. L. Thorp and W. F. Crowder, in 1941, using two larger samples, one of 407 industries and one of only 216 of those same industries, found negligible and low correlation values respectively over the same period. Then, in 1942, A.C. Neal tested for several variables and found that input cost changes affected the results enough to

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[4] "Instability" here is considered to mean the same as "fluctuations" whether regular (seasonal, cyclic, etc.) or irregular.

[5] For a more extensive resumé of these studies see Frederic M. Scherer, Industrial Market Structure and Economic Performance, Chicago: Rand McNally and Company, 1970, pp. 284-303, and W.G. Shepherd, Market Power and Economic Welfare, New York: Random House, 1970, pp.199-202, and the specific references cited there.

put doubt on the previous findings for the Great Depression era.

Several postwar inflation studies, notably those by H. M. Levinson and G. C. Means, also found positive relationships between concentration ratios and price ranges in the early 1950's.[6/] However, H. J. De Pedwin and R. T. Selden, in a much criticized study done in 1963, found no such relationship. A study by L. W. Weiss found a slight reversal of the positive findings when the subperiod 1959 to 1963 was examined, leading him, and others, to conclude that industries with high market power tend to raise prices aggressively in normal times, raise prices slowly in booms, and to hold them stable in downswings. However, important interfirm differentials can make case by case studies appropriate. Scherer's considered view is that "...the price setting and wage bargaining practices of concentrated industries do make it more difficult to maintain overall price stability and full employment simultaneously".[7/] On the question of output instability we can quote W.G. Shepherd in his recent text. [8/] Quite briefly he states that, "For the whole range of American manufacturing industries, market power ...is strongly associated with relative instability of both output and employment.... Yet this also reflects something

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[6/] Scherer, op. cit., pp. 296-303 and Shepherd, op. cit., pp.199-202.

[7/] Scherer, op. cit., p.303. This view is also held by J.K. Galbraith, "Market Structure and Stabilization Policy", Review of Economics and Statistics, May 1957, pp. 124-33.

[8/] W.G. Shepherd, Market Power and Economic Welfare, New York: London House, 1970, pp.54-54, 199-202, 240-241, and references cited there.

else...heavy producer-goods industries typically face relatively sharp fluctuation in demand. This, rather than market power, may cause the swings in production."[9] Tests of the general case are not complete, but the evidence that exists is such as to"...suggest a presumption that market power may appreciably accentuate macroeconomic fluctuation, at least in the downward direction.[10] But, it must be noted here, he refers to manufacturing industries and even this weak impression may not apply to construction.

Investment

The second route to output instability is through the investment function. Here the lacunnae are even greater. Researchers like Scitovsky, Duesenberry and Bain had made references to the theoretical possibility of the market's structural features altering the stability of investment flow but it took until 1969 for Scherer to present the first real empirical study. Using U.S. private sector data for 1954 to 1963 he concluded that, ceteris paribus,"...investment outlays tend to be more unstable relative to their trend values in concentrated than in atomistically structured industries...".[11] The earlier theoretical viewpoints were at odds. Whether this injects new incentive to research the area waits to be seen. The evidence so far examined gives a positive but not dominant role to concentration as probably the most

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[9] Ibid, p. 201.

[10] Ibid.

[11] F.M. Scherer, op. cit., pp. 318-23 and "Market Structure and the Stability of Investment", American Economics Association, Papers and Proceedings, v. 59, (May 1969), pp. 72-79, and op. cit., pp.318-23.

important structural variable, but one can legitimately doubt that we have and unrecognized issue. More likely, it is an issue of small total significance, especially in the context of other variables.

Instability and Structure

The questions that arises next concern the effects on structural features that may be caused by instability. For example, is market power expanded, or reduced by instability in an industry? This question is a difficult one to answer because many things help generate market power, such as product life cycles, government policies, scale economies, etc. Both growth and decline in an industry, whether cyclically repetitive or not, can affect market power, but in ways which react quite clearly in the context of the other determining influences.12/ Shepherd cautiously holds that stability encourages the development of market power while instability, with its very change and uncertainty, can inhibit expanding market power. However, by reducing the chance of survival for small or weak firms and new entrants it just might prevent the decline of market power.13/

Other elements of structure can conceivably be affected by instability in demand. Among them might be the degree of product differentiation, internal cost patterns, turnover rates among leading firms, exit rates, conditions of entry, vertical or horizontal integration and so on. The literature on these topics is

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12/ See Scherer, op. cit., pp.42-43, 88-90, 125-30, 229-30, and elsewhere.

13/ Shepherd, op. cit., pp. 35, 39.

not very extensive, to state the case enphenistically, with cyclical fluctuations being noted only here and there as possible influences. Hypotheses can be stated and tested, but the subject has seldom seemed important enough to warrant the effort. This study proposes to do some evaluation of this problem, but only for the construction industry and transposition to other cases may not be valid.

Concluding Note

At this point, when we have seen that the main concern of this particular study is a topic barren of previous research, and interest, it would seem appropriate to be explicit about the necessary implications. There is little to do but either break new ground or abandon the study. The chance of testing generalized theories, either again or for the first time is negligible. However a good opportunity for some new theory might be seized, although its testing must be in the context of a special industry, construction.

Specific Studies of Construction

There have been three other studies of the construction industry that ought to be noted for industrial organization content. Two are Canadian; the other is American. Only one study was particularly concerned with the cycle, although the other two recognize its impact is important.

In 1955 the Royal Bank of Canada prepared a study of the

Canadian contract construction industry.[14] It covered most of the topics in this study but also extended itself to areas covered by other Reference studies. Analysis could not extend beyond the period 1946-1955. Data was more scarce than is the case today. Its findings are not substantively different from the general conditions of today. Contract construction took up the lion's share of the total construction activity. Business arrangements among general contractors and the many subcontracting sub-trades were made by bid tendering or private negotiation. The range of contracting firms by size extended over a wide range, as did project sizes. Bankruptcy rates were approximately equal to the industry's share in the economy. Entry and exit was easy and believed to be at moderately high rates. Some firms were national in the range of activity but most others were very locally oriented. Cycles and seasonality presented themselves as important matters of concern. Fears of excessive competition and calls for entry control were also discussed. Profit rates put the industry in a generally better than average position among all industries in the economy. Basically, the major conditions, concerns, and practices were much the same as today.

The second study, done for the United States in the late 1960's also extends its work to subjects of other Reference Studies beyond this one.[15] It finds the contract system operates to enable

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[14] The Royal Bank of Canada, The Canadian Construction Industry, study for the Royal Commission on Canada's Economic Prospects, Ottawa, 1956.

[15] P. J. Cassimatis, The Economics of the Construction Industry, Studies in Business Economics, No. 111, New York: The Conference Board, 1969.

a complex and caried pattern of demand to be met effectively although he suggests it inhibits R&D. This means there is little vertical integration, except in so far as the general contractor-subcontractor links can be called integration. A wide range of specialties is needed and in each group a full spectrum of firm sizes exits. Total business is concentrated into a small percent of total firms but the absolute number of firms in the group is over 8,000, quite large. Barriers to entry are low and the entry rate is high. There has been a long term growth in the proportion of incorporated firms in the industry. The share of the market held by medium sized firms has risen in the post-War period. Bidding is considered to be a barrier to entry when it employs the prequalification practices typical of special or very large projects, but it is also the way in which very effective competition can arise. All of these main features apply to the current Canadian industry.

These two books find a similar set of results as this study. They don't present as many details, but the available data was less extensive. Their conclusions are not inconsistent with those here either. The set of Reference Studies covers in much more detail the same subjects covered by these previous studies.

The third study to note is that by F. Wildgen, originally for the Economic Council but published elsewhere.[16] He did not examine all of the main hypotheses put forward in this study but did note that profits were both higher and more volatile than in other industries, that competition is strong and creates flexible prices over different stages of the cycle, and that commercial failures were an issue of concern. He attributed easy entry as a cause of "excessive competition" and subsequently of a failure of the industry to achieve efficient size firms. But he fails to examine what efficient size of firm may be, thereby making an inapplicable transfer to this industry of an otherwise very valid concept. He calls the varying size and type of demand an "imperfection" in the market and, in my view, employs an irrelevant concept of a "perfect market" which would deny small scale, specialized sectors of the market a legitimate function. This study later takes the position that the demand heterogeneity is quite valid, will persist, and that the structure is only efficient if it meets that demand. In this context the very concept of a "minimum-efficient size" firm loses relevance for the aggregate market called construction. These differences are not trivial because they imply very different policy and contrast the established wisdom with new independent consideration. The source of Wildgen's views are, in my opinion, an inadequate understanding of why the contract system is, and will be, the most efficient way to organize this industry, even if demand is constant

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[16] F. W. Wildgen, "Economic Aspects: Work, Income and Cost Stabilization", Chapter 2 of H. C. Goldenberg, (ed.), Construction Labour Relations, Canadian Construction Association, Ottawa, 1968, pp. 26-97, especially pp. 60-67.

or regular. Construction is not like other industries because of enduring, legitimate, technical and economic reasons only one of which is the unavoidable dispersion of work sites. It is incorrect to treat it in an unmodified model quite useful for manufacturing.

The best way to summarize these studies is to say that they all treat "construction" as a much too homogeneous activity. They treat the cycle as important, but too important in my view for certain purposes related to the industrial structure. This study questions these interpretations and proves that the structure is cyclically neutral.

2.4 Defining the Construction Industry

Before launching into either a study or a report on the industrial organization of the construction industry it is important to have a useful idea of what the industry boundaries are. Because of special features of the markets in this industry the so-called traditional framework requires some special terminology to encompass the modifications adequately and to distinguich them from the more standard context. Thus, some discussion of the generally used criteria for identifying industrial groups will be presented and, from this certain important and unique features of the industry can be highlighted prior to immersion in the rest of the study.

Defining an Industry

The concept of an "industry", as a collection of "firms", is a basic one for economic analysis. There are several ways to define, describe, identify or classify the specific member firms of any particular industry. That is, the selection of membership criteria, including the boundaries or limits that may apply, is very important in any study, but in this study it needs extra care because of certain potentials for confusion. Exact selection of criteria will be highly dependent upon specific needs of the particular analysis, and for that reason it is important to appropriately comparable members of the sets and subsets of firms. The firm, of course, is the basic economic unit for producing and/or selling goods and/or services.

There are two major classes of selection criteria: (1) demand side or input criteria, and (2) supply side or output criteria. In the former, each set would include those firms which bought or used some particular good or service, for example, the users of natural gas. In the latter, the more commonly adopted general set of selection criteria, there are four main subsidiary categories: (1) the product sold, (2) the function performed, (3) the process used, and (4) the skills involved. Examples of each, in turn, are: the wheat flour industry, the transportation industry, the iron castings industry, and the chiropractic industry. A brief discussion of each of these supply side criteria follows. Some overlapping of the cases occurs and where this exists the reason for separate categories can be considered one of emphasis.

1. The Product Classification

The product or output classification can be considered to have two main subdivisions: (1) products with technical homogeneity, e.g., sulphuric acid, and (2) products with homogeneity in use, e.g., containers. In most industry analyses, and theoretical discussions of industries and markets, one of these criteria dominates.

The first subsidiary distinction, technical homogeneity, is based totally on the identical technical features of the product or output which makes substitutability among the outputs of each firm in the industry infinitely great. No distinction is made with regard to the process which creates the product. While this is the basic theoretical definition, it is not always adequate in practical studies for several reasons. For example, such homogeneous products may come from many sources (as natural resources, as main products, as by-products, or from any of several different technical processes) and since such distinctions may be important alterate bases of classification may be necessary when examining specific cases.

The second classifying distinction relates to the use of the product in serving the needs and wants of the purchaser. Often there are several items which, while technically heterogeneous in certain dimensions, are substitutable in a sense of application. The differences may be small technically, such as the typical products of oligopolies where product differentiation is created, or they may be more substantial such as those resulting from different production methods. For examples, consider brands of detergent and containers which may be made of wood, or wood products like paper, or artificial products like plastics, or minerals such as aluminum. Conceptually it is possible to identify such substitutable products, or gaps in the chain of substitutes, with measures of cross price elasticity and to select the relevant firms from these results.

2. The Functional Classification

This classification may in fact be very similar to that for products with great homogeneity in use, but might be considered a useful separate category especially when considering the provision of services. The important distinction here will be that where both product and production processes are heterogeneous, and a service is being performed, the criterion of "functional substitutability" can be most useful. As examples, consider transportation in general, varieties of land transportation, and communication. In these, both products and processes can take different forms. "News", for example, may reach the users as both printed paper and electronic audio-video outputs, each of which carries out the same basic function of informing yet employs significantly distinct production processes and output forms.

3. The Production Process Classification

There are two main subdivisions in the criterion of production processes: (1) technical homogeneity of the process mix, e.g., metal casting, and (2) homogeneity in the technical function performed, e.g. underground mining.

To expand on the first subdivision, we note that many production processes turn out a multiplicity of final products, the uese of which may not in fact compete with each other in any real way as final products even though raw material and the production process are the same for all items. For example, any

single iron foundry may make engine blocks, manhole covers, and ship's anchors, all from the same material and technological equipment. In such cases the raw material, the basic technical process, and the material qualities of the output are the same, but the physical features and the uses of the final items are not interchangeable. Thus the firms may in fact be competing as producers but the final product classification will fail to identify all relevant firms.

The second subgroup is defined by those processes which execute a particular basic function but do not always use the same raw material not do they turn out final products which are technically very similar. Examples would be packaging machines, mising machines, etc. This tends to overlap with the earlier noted Functional Classification, but is distinguished by virtue of its being involved in manufacturing and processing rather than in the service industries.

4. The Skill Criterion

A fourth general classification criterion that may sometimes be useful is that related to the particular qualities and skills of the persons carrying out a specific function. This is especially applicable to service activities, e.g., management, medical diagnosis, or even economics. In such cases the function and the people who carry out the function become

sufficiently intermingled that this criterion is the most suitable. The human capital is so dominant in such cases that the industry is in fact made up of the people possessing the skills.

In sum, then, there are four main criteria of classification and identification that can be applied to collect relevant firms into meaningful industrial groups for analysis. They are: product, function, process and skill. Each has its own particular utility. Practical application in the case of the construction industry will need more than one set of criteria.

The Construction Industry

"Construction" has been defined as "the creation of any structure or the alteration of the natural topography of the ground, plus the maintenance and repair of such products".[17] In this context then the way to classify the industry's members might fit into any or all of the four basic criteria. But, practical identification of members is not so easy and it is really through this practical problem that the reason for multiple identification criteria arises. Let us look at each option and review why it fails to stand alone as an adequate and complete criteria.

The product criteria alone is inadequate for two reasons. First, the "product" of the construction industry is much like the product of an assembly plant in the context of a manufacturing industry. Construction as an activity or a function of putting material into shapes so the functional criterion is much more relevant. The final product, structures, often sell in markets where no construction firm operates as such. In fact much of the market for many structures, e.g. housing, is related to the existing stock rather than new stock. Therefore to use the product criterion and to identify industry membership by relation to those who sell products which have been constructed will be quite inappropriate. Secondly, the data that has been collected for use does not follow, in all cases, the product criterion. Rather the data often uses the function criterion, as for example it is related to the electrical contractors, those who install electrical equipment. Sometimes it may appear to be otherwise, as for example in the case of highway contractors, but these really are adopting a functional definition and merely set up a specific subcategory of "those who construct". And, even the so-called "housing developer"

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[17] The Royal Bank of Canada, The Canadian Construction Industry, op. cit., p. 46.

may not be the actual construction firm itself but rather just someone who buys the services of the construction firm. Further discussion of the important differences among the various participants in the whole set of markets (land speculators, project dwelopers, real estate firms, etc.) that are all too often inadequately distinguished in studies of "construction" can be found in the M.R. Prentis study.

The process criterion is not very necessary in this case, mostly because it is adequately encompassed by the functional criterion. However, there are groups who carry out activities in the context of the forementioned definition of construction but can best be identified by reference to their labour skills. For example, the repair section of construction, such as plumbers and painters, is identified by reference to the skills. Members of these subsectors of the construction industry are often one man shops, sole proprietorships, or small partnerships.

A brief note on the question of whether or not construction is a service industry or not might help. Some suggest it is; some say it is not. Probably it has real elements of both. Some identify a service industry as one where the goods come and go unchanged, as in a retail store, or where there are changes made to a product which is not owned by the servicing industry, as in repair shops, or, where there is a careful matching of a product to the customer's very specific need, or where the product, if manufactured, is made from other person's materials. In some ways these criteria help describe part of the construction industry's milieu. But, generally this author is of the opinion that the basic question is not a particularly productive one. It might be analagous in utility to asking if modern chicken farms are really in

agriculture as opposed to chemical processing. Elements of both apply and only more specific questions yeild useful answers.

In summary then, the construction industry consists of those firms, corporate or otherwise, which perform the activities related to erecting, altering and repairing of structures or parts of structures and altering the topography of the land. This relies mostly on a functional definition of the group, but must include certain groups typically identified by skill. It does not include those firms which just sell, buy, lease or use such structures although some firms who do these things often do have construction as one of their diversified activities.

2.5 Basic Features of Demand

Construction demand has some special dimensions that have important influences on the industry's structure and its conduct. If these special characteristics are not noted then one's understanding of the industry will be incomplete. These characteristics are additional to the seasonal and cyclical dimensions discussed in the previous section on the role of the industry in the economy.

First of all, the final product has all of the qualities of a custom-made item. It is extremely specific and thus not very adaptable to mass production. In fact each item is totally unique, designed for a unique need, and custom-made to the particular specifications of the situation, although there are of course common types of component among similar items. For most classes of construction activity the sale is made on a basis of special order with the product suited to the specific needs. Some speculative buildings can be made but only in cases where specific needs are identifiable in advance, both as to technical qualities and as to location. Thus, houses can be built for a subdivision on expectation of rapid sale, but special factories are not susceptible to this.

The demand may originate in one of three places: (1) owner-users, (2) owners seeking resale, or (3) owners seeking to rent. Variations abound to complicate such circumstances, such as the demand originating from a business seeking to resell with a lease-back provision. Such methods allow the ultimate user to specify and control construction but then to borrow the capital from someone seeking to invest money in a building with a satisfied tenant. While the financial arrangements make this appear as an example of the second case, it is in fact an example of the first. The resale market for some construction projects should not be ignored, but neither should it be taken as the same thing as the market demand for new projects.

A second feature is that most construction projects are complex requiring a variety of materials, skills and capital for their completion as well as extensive preproduction planning. One important effect of this will be a series of lags between the decision to construct a project, the preparation of specific plans, and the completion of the project.

A third important quality of the product is its geographic immobility. Bridges for example are built to cross a very specific obstacle located at a very specific position. They are built on that site and do not subsequently move. Thus building in expectation of later sale is not a common feature of construction projects. And each site is dispersed, often quite separate from other similar sites of the same kind being built simultaneously.

A fourth basic feature is the derived status of the demand. That is, it is the demand for other things that take place in or on the construction product that give rise to the demand for the construction project itself. Construction projects have all the dimensions of a capital good, especially durability, which gives rise to indirect influences on the flow of demand along the lines of the capital stock adjustment model. And, eventually, there will be a subsequent demand for repair and maintenance of the structure followed, in the much longer run, by a demand for replacement.

Another important characteristic to note is the often sizeable lumpiness of the demand as measured in terms of its size compared to the output of the specific firm or the buyer. For example, the gross value of one contract may easily exceed the net profit for some firms which can have important effects on the operations of the markets. The other side of this lumpiness comes in relation to the size of the product in terms of the buyer's budget. Often the price of a construction project involves a major financial

commitment for the buyer in relation to his income, with housing as a perfect example of this aspect.

All of these main sets of features take on a different balance for each of the very many types of construction product. But, in total, the fact that these products are durable and immobile capital goods with very specific technical qualities has strong influence on the markets for construction activities, both in the way demand comes forward and in the way supply meets it, that is on the structure, conduct and performance of the industry.

Another way to look at the demand is to see its buyers as classes of purchasers. They are many, each having various special demands. The following table, Table 2.2 shows these for 1972. The thirteen categories shown are further subdivided into about seventy in all for regular data purposes.

In sum then there are several very important qualitative features of demand that must be considered because they have a major determining influence on the industry's structure. Demand is: (1) derived, (2) for a custom designed, custom made, site specific product, (3) variable in size, cost, complexity, (4) dispersed widely yet immobile when finished, (5) lumpy, expensive and carefully purchased, and (6) requires very specialized skills to be met properly.

TABLE 2.2

VALUE OF CONSTRUCTION OUTPUT BY PRINCIPAL TYPE,

CANADA

Type of Construction	1972	
	Value	Per cent of total
	$ mill	%
Residential	5,184	31.7
Industrial	908	5.6
Commercial	1,475	9.0
Institutional	1,447	8.9
Other Building	457	2.8
TOTAL BUILDING CONSTRUCTION	9,471	58.0
Marine	201	1.2
Road, Highway & Aerodrome Construction	1,510	9.2
Waterworks and Sewage Systems	664	4.1
Dams and Irrigation	69	0.4
Electric Power Construction	1,282	7.8
Railway, Telephone and Telegraph Construction	639	3.9
Gas and Oil Facilities	1,385	8.5
Other Engineering Construction	1,120	6.9
TOTAL ENGINEERING	6,870	42.0
TOTAL CONSTRUCTION	16,341	100.0

Source: Statistics Canada, Construction in Canada, (64-201), 1970-2, Table 3, p. 7.

2.6 Basic Features of Supply

There are some important technical and qualitative elements in the supply function that merit explicit recognition because they influence market activity. By contrast with manufacturing industries wherein the assembly operation is just one of many operations which are usually carried on simultaneously, much construction tends to be analagous to the one operation, assembly. And, due to the nature of most construction projects, it is not as easy to carry on all operations simultaneously in a regular flow. Consider, as an illustration, an apartment building. For technical reasons the careful sequencing of the steps such as site clearing, excavation, frame erection, floor laying, utility installation, etc., is necessary, and thus keeping all units of labour and capital busy all the time cannot always be arranged. The desire to avoid idle capacity costs created by these technical constraints has influenced the way that the supply side of the market is organized. The wide variety of heterogeneous activities that make up any particular project can also affect the impact of new technical change, an important influence on the supply side of the market.

Another vital feature in the supply function is the lags between the initiation of a project and its completion. This time period required to complete one unit is called the production period. Because of its length, ranging from a few days up to several years, the production period creates significant financing problems and delays between buying decisions and acquisition of a useful product.

The supply function under consideration is of course that for the resources used to construct not the supply of projects which have been constructed. Thus we should examine those elasticities related to workers, capital and entrepreneurs. There appears to be no particular constraints on labour that act to inhibit growth or flexibility. Capital mobility is not inhibited severely and entrepreneurial talent can enter over quite low barriers to entry. The seasonal and cyclical features inevitably mean that some excess supply exists for part of the year and part of the cycle.

This broad overview will be examined more in the subsegnent sections on the structure of the industry which follows.

2.7 Defining the Markets

Markets are really the matching of buyers and sellers. This task may be done more or less efficiently and the imperfections and peculiarities of this is the real subject matter of this paper. It becomes clearer as one examines this industry that it is in fact a closely interacting set of industries, that is there are a series of closely interacting markets. Differences among the buyers do create significances for the markets in the case of construction. Differences among the products, heterogeneities, are very important, as are special demand features to be discussed below. If markets put buyers and sellers together then the features applicable to them can have peculiar and important effects. There are some products where the geographic boundaries are national, some where these boundaries are more regional, and some where the limits are quite local. Special projects such as large oil and gas pipelines are often built by firms which operate internationally; more standard projects such as housing subdivisions are usually built by firms which tend to restrict themselves to regional or even provincial zones; repair and maintenance firms are almost always very local in the market area they serve. These factors can be a function of size also, a dimension that inhibits cross-sectional analysis. Thus, even within provincial breakdowns concentration ratios may not yield good evidence of the state of competition. Here again, this section is intended to raise the general issue prior to detailed discussion which follows with the numerical analysis.

2.8 Nature of Basic Policy Issues

Because construction is sizeable and plays such a basic role in the economy, its cyclical fluctuations have been a concern of governments which were interested both in aggregate economic trends and in the problems of the specific industries. Many observers have accused governments of using construction as the pump in pump-priming activities. Some object to this in principle; some object to this because of the way in which it has been administered. In view of what appeared to be chronic cyclical instability the government requested the Economic Council of Canada to undertake a series of studies on this industry.

The General Issues

The general policy questions are easier to state than to analyse. First, are the factual questions. How much instability, however defined, is there in the Canadian construction industry? What are its causes? What are its effects? Secondly, there are the policy-oriented questions. What other patterns, several of which may be defined, are real options? Are these practically obtainable with the policy tools currently accepted in our economic order? What are the net benefits, including an accounting for transition costs, of each viable option? And, finally, which option is preferred?

Subsidiary questions within the context of the study are, of course, numerous. For example, in the review of the effects of the cyclical pattern, questions such as the following must be answered. What are the costs, in real terms, such as lost output and resource misallocation, of a fluctuating pattern of activity in construction? Who bears

these costs: workers, materials suppliers, entrepreneurs, the users of final products in the rest of the economy, etc..? Is this pattern different, in size and distribution from those with an alternative pattern of construction, say trend value growth?

Basically the main area of the reference concern is macroeconomics. Studies on aggregate housing policy, government construction spending, labour market operations, and macrosimulation with the CANDIDE Model are being done to promote this dimension. But, additionally, micro-economic analysis is contributing to illuminate the picture more thoroughly. These include studies on labour institutions, microproductivity and costs, financial flows, technological impact, business management and, this study, the industrial organization of the markets for construction activities.

The Industrial Organization Area

The industrial organization study also faces questions in the two major areas, questions of fact and questions of policy. Factual questions include the following. Which dimensions of the industrial organization of this industry are relevant to cyclical, or other periodic irregularities in the flow of output? Are these causal features which amplify or aggravate cycles? Or are they neutral, even counter-cyclical in their impact? What are the mechanisms behind these? Are the routes of impact direct or indirect? On the other hand, the features of the industrial organization may be only effects of the cyclical instabilities in the construction industry. Or, the cyclical effects may be minor compared to other causative influences on the industrial organization of the construction industry.

The policy oriented questions must be considered, for, after all, the project is part of a total study intended to yield policy proposals. Do any of the industrial organization variables have any potential as policy tools for influencing cyclical patterns? How much? In what manner would they operate? And, most importantly, can these features be modified in such a way as to reduce their effect on the instability in the flow of output, without creating undesirable potential or real effects on other performance measures? That is, can they be used for cyclical modification and remain consistent with other policy goals in the system? The subject of these tools being part of a general policy program should be stressed at this point. From the very beginning of the project it was not anticipated that industrial organization features were dominant influences, and thereby they could not be the decisive policy tools. However, factors related to industrial organization elements can be frustrating to the effective implementation of some other policy tools, and for this reason they need to be included in any total policy package.

CHAPTER 3

GENERAL STRUCTURAL FEATURES

3.1 Introduction

This chapter is intended to describe and explain the existence and endurance of several important structural features in the construction industry. For those who feel they know how the industry is structured it may seem an unnecessary statement of the obvious. However, this is being prepared as part of a research effort and is aimed at policy makers and students of industrial structure. It is with a pedagogic orientation that my explanation of the industry's structure is presented.

Construction has a very interesting structure with several important differences from other, more typical, structures. As research conclusions I suggest that the industry is structured as it is because of a combination of technical and economic features in its environment that act to make the observed structure the market-induced answer for an efficient structure. The cycle is a mere nuisance in the full context of influences. Alteration of the structure is unlikely to arise, would not persist if forced, and could not alter the cyclical pattern of the flow of output. The current structure too is neutral to the business cycle in construction activity.

The rest of this chapter consists of, first, a description of the important general structural features, secondly, an explanation of the reasons behind the observed structure, thirdly, specific examination of the role of the construction cycle, and finally some other observations.

3.2 Basic Structural Features

There are three main structural features of importance in understanding the construction industry. These features are definitely interrelated. First is the existence of an enduring spectrum of firms by size from small to large. Second is a series of sub-industries which can be classified by reference to the specialization in one stage of construction activity. Third is the pattern of temporary and irregular conditions in the vertical integration of this industry. All are explained by a combination of special features of demand flow and technical elements of the production process. This section of the chapter will describe the general outline of the structural profile and the causal elements. The next section will explain the pattern of vertical integration in the industry with reference to the economic realities. Chapter 4 will elaborate the descriptive detail with reference to several of the sub-industries in the total construction industry.

The Size Spectrum

Construction firms are those units of management, capital and labour which build things. The range of projects is extensive in size. Within the definition of construction one finds repairs and maintenance. New projects range over an even larger spectrum of sizes. Examples include replacement sidewalks in urban areas, repaving of roads, and miles of totally new highways. For each size of project there tends to be a specific sector of the industry that will be willing to work on it. Most large firms do not seek out the smaller projects when they seek work; small firms, by definition, do not obtain major projects.

These statements may seem self-evident, but this is one basic descriptive fact about the flow of construction

projects and it is quite related to understanding the industrial structure. As long as this size pattern of projects endures, and none doubt it will persist, then a wide range of sizes of firms will persist. An extensive size distribution of construction firms is an enduring structural element in the industry. One should not expect this major structural component to change.

The Sub-Industry Spectrum

With a broad definition of "construction" we also get a wide range of type of project. Each has its own production function in terms of the qualities of capital and labour skills. Intertask mobility is restricted because of this imperfect substitutability in a technical sense. It is also inhibited by certain labour union institutions but they are not the major reason. Projects range over sidewalk reconstruction, new pipeline installation, house building, factory construction, electricals installation, plumbing and so on.

These facts about the variety of products in the demand will also persist, as will the specialization of equipment and skills. Inevitably this means specialized firms, as collections of labour, management and capital, will also persist. Expectations to the contrary are unwarranted. Immediately, then, one must conclude that a series of interrelated but identifiable sub-industriesis an enduring feature of the total construction industry.

The Vertical Integration

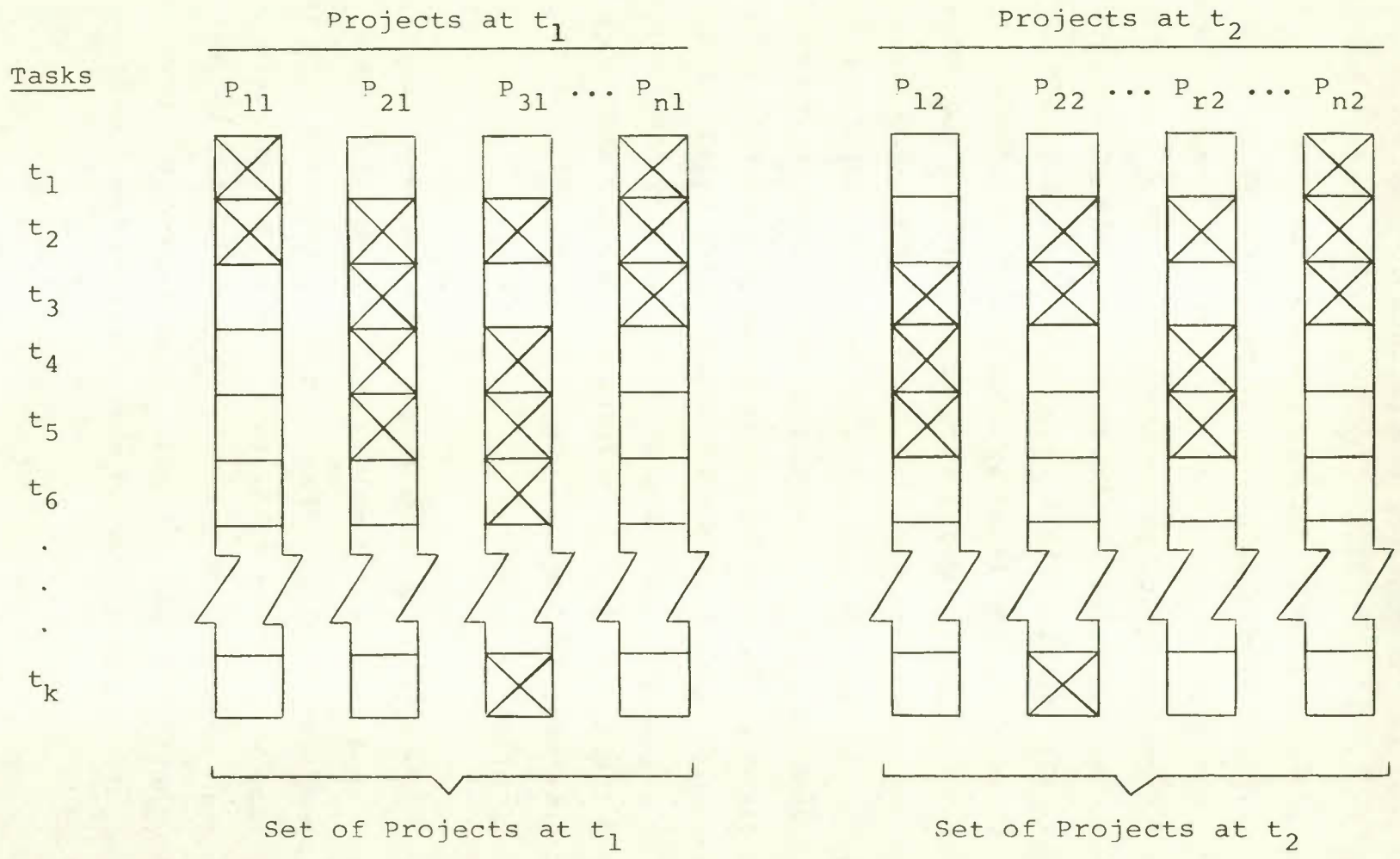
A description of the pattern of vertical integration is now presented. First we will consider the technical structure

of construction projects. Then we will describe the manner in which firms integrate. An explanation of the reasons for the existence and persistence of this pattern follow in the subsequent section of this chapter.

What is a typical construction project? How can it be viewed in a context that is related to industrial structure? We can start off with a technical orientation since it has been found that the technical dimensions are a major influence. We will consider each project (P_i) as consisting of a series of distinct tasks (t_j). An example of a project is a shopping centre or an apartment house; an example of a task is the erection of the structural steel frame or the installation of the elevators. (The symbol t_{ij} represents the j tasks in project i. There are n projects at each time and m tasks in each project). This means that the specific set of tasks needed at any point of time is related to both the number of projects and the technical features of those particular projects. For example, if there were no high-rise building projects one year but lots of new highways then there would be few tasks of installing elevators but many for surfacing roads. Each of these tasks it will be recalled puts a specialized set of labour skills and capital equipment to work. The attached graphical presentation sets out two possible time periods, each of which has two different mixes of projects and tasks. The chart is only descriptive of the mix of stages of production and the differences that can arise with shifts in the nature of demand (See Chart 3.1).

Chart 3.1

INTERTEMPORAL COMPARISON OF PROJECTS AND TASK SETS



Points Illustrated: (a) Differential mix of projects over time.
(b) Differential mix of tasks over time.

Next we can consider the pattern of interaction among the firms in the industry, the vertical integration. Again this section is only descriptive and illustrative. Each set of firms specializing in any specific set of tasks and which are actually or potentially liable to compete with each other form a stage of production. They are a sub-industry for example, the electrical contractors. A stage of production is a technically distinct task necessary in the sequence of steps that result in the final product being completed. For example, digging the foundation hole, erecting the superstructure and installing the electrical equipment are separate stages of production in building a high-rise commercial office. They also must be done in a sequence constrained by the technical realities. Their order of performance cannot be altered. There are some tasks which can be done simultaneously in time, such as painting and installing windows, but only some tasks fit this pattern. It is also helpful to note the fact that some projects may only require one task, as in the case of replacing roofing on a house.

In sum, then, we have sets of tasks in any project, some of which can be done simultaneously but most of which must be done sequentially. This is to be contrasted with an assembly line where these conditions also hold, but where each project (each unit of product) is much smaller in relation to the firm's total output. This element of lumpiness is also an important feature in understanding the construction environment.

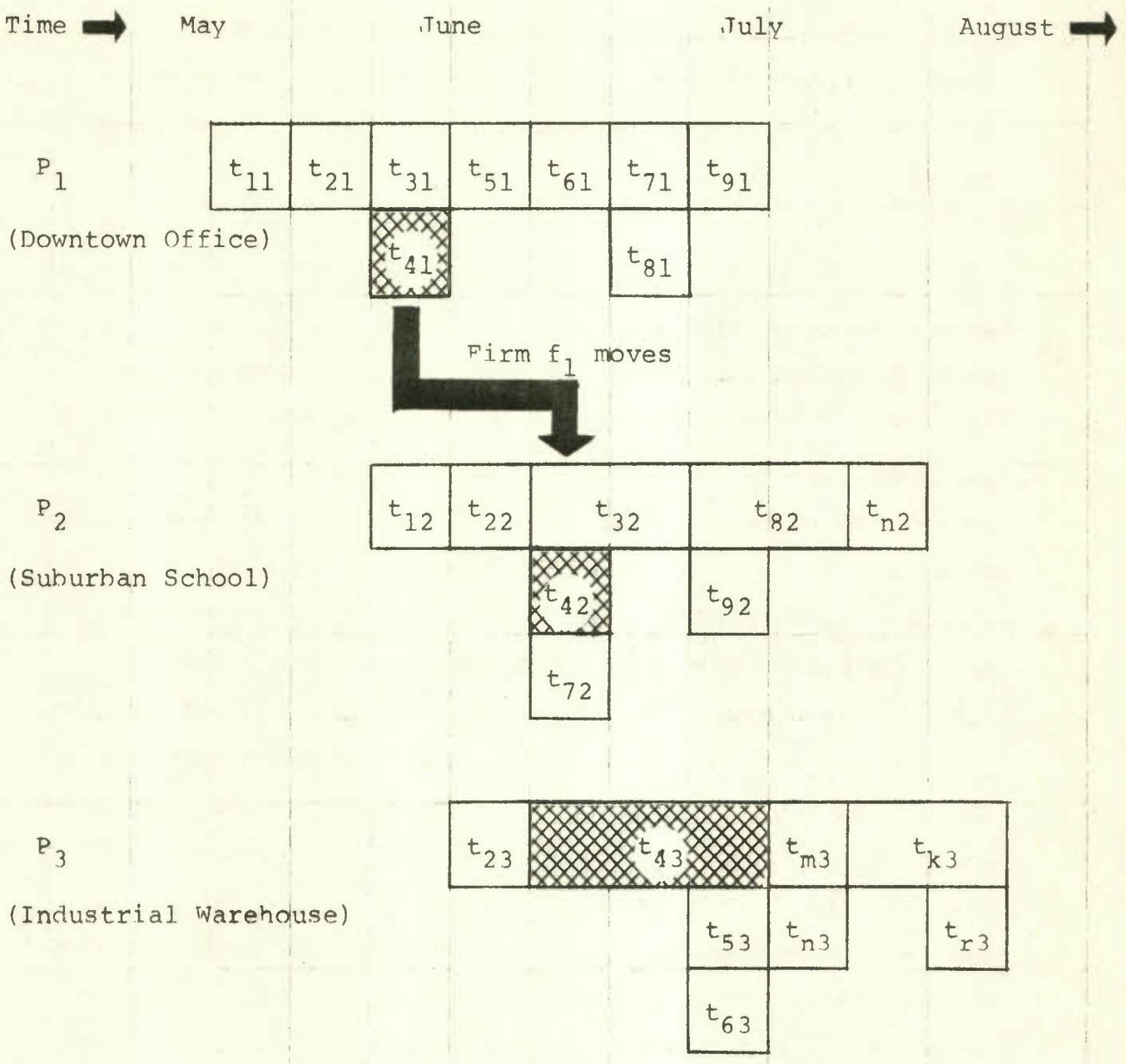
Now, with this technical context of projects consisting of different sets of specialized tasks and specialized

units of capital and labour to do the tasks, let us describe how firms integrate vertically. That is, let us describe now the separate stages of production work together. It is quite different from the pattern we would observe in a smoothly flowing manufacturing plant (firm) such as automobiles. In fact that system of integration is not feasible for construction.

Chart 3.2 shows three projects (P_1, P_2, and P_3), each consisting of a series of tasks (t_{1j}, t_{2j}, and t_{3j}). We will concentrate on the behaviour of one specialized firm (f_1) which is, for illustration an electrical contractor. Its staff consists of licensed electricians and its equipment is related to those tasks only. (This is represented in Chart 3.2 by t_{4j}, and is cross-hatched.) At time period June the firm is working on project P_1 where all necessary previous tasks have been completed. By time period July firm f_1 has finished on project P_1 and, if it wants to work it must go to P_2 and/or P_3. It cannot do other tasks since its skills are not adaptable. At the time period July there are other firms seeking to compete with our illustrative electricians for the work on P_2 and P_3. By use of the bid system (to be discussed later), the owners of these projects choose someone to do the electricals on P_2 and P_3. Assume here that firm f_1 goes to P_2 but not to P_3. In later time periods it goes on to other projects P_m and P_q, etc. That is, firm f_1 is constantly finishing its role in a project and then going on to do its tasks in another project, at a separate location of course. This pattern of movement from project to project, including place to place, is the regular pattern of work for the firm. Technical reasons do not permit it to

Chart 3.2

TASKS, PROJECTS AND FIRM MOVEMENTS



Notes: (1) Each box represents a separate task and its length represents the duration of time needed to complete that task. Most tasks are sequential but some are simultaneous.

(2) t_{ij} represents task number i in project j.

(3) t_{4j} represents task 4 (electricals) in project j (see text).

stay put while the work flows past, as would be the case with the installers of electrical accessories in an automobile on the assembly line.

Another way to describe this pattern of vertical integration, or linkages among firms in the several stages of production, is to say it is regularly rearranging or inconstant. Seldom will firm f_1 be doing its task in a superstructure built by the same firms that specialized in that particular task. The firms at each stage of production are always amalgamating with new sets of firms at the other stages. Each amalgamation is temporary by the very nature of the production arrangements as they now operate. It is the specialization of the tasks and firms that perform them plus the pattern of flow of projects, i.e. sets of sequential tasks, that have induced the continuation of irregular, temporary patterns of vertical integration as contrasted with the more permanent and stable patterns of vertical integration common elsewhere in the economy.

To repeat a point, some readers may feel that this description is an excessively extensive portrayal of the obvious. It may be for those in the industry, but most of the aim of this report is towards policy makers and students of industrial structure. And, the orientation is clearly pedagogic in an attempt to present why I believe, as research conclusions, that this structure was worth examining and will persist for sound technical and economic reasons. Next we turn to an examination of the economic explanation of this pattern of irregular, temporary vertical integration.

3.3 Contract Construction

The practice of firms joining up to do their specialized part of a whole project then moving on to another project built by a separate set of other firms is supported by the legal practice of specific contracts. Some construction activity is done by regular employees of the buyer. For example, there are municipalities which build their own roads. This is called "own account" construction. However, about 80 per cent of construction is done by specially and temporarily purchased services. Hence the common term contractors to refer to builders of various construction projects.

What Are the Trends for Contracting?

In the period between 1951 and 1970 the role of "own account" construction has fallen from 32.0 per cent of total construction to only 20.1 per cent. The decline in the proportion was generally continuous, at an annual rate of 2.4 per cent.

This own account construction can be broken into three subcategories: First is "utilities", which fell from a position of holding nearly 15 per cent of total construction in 1951 to about 8 per cent in 1970. This decline in share was at an annual rate of 2.3 per cent. Own account construction by governments fell from nearly 9 per cent of total to about 6 per cent over the same period. This was an annual rate of decline in the share of total of about 1.1 per cent.

1/ Numerical data is based on the Statistics Canada publication, Construction in Canada, Bulletin No. 64-201, annual.

The residual component, "Others", also fell in its share of total construction, at an annual rate of decline of share of 4.1 per cent. That is, it fell from near 8 per cent to near 5 per cent of total construction. Thus the declining trend for own account construction was general for all classes of buyers.

Another division of this data into two types of construction, "new" and "repair", also shows that the own account work is on the decline. In 1951 about 26 per cent of new construction was done by own account procedures but it fell to only 15 per cent by 1970. The trend in repair work done on own account also showed a decline from nearly 48 per cent in 1951 to near 41 per cent in 1970. This decline in share was at an annual rate of 1.9 per cent for the period, although the share did rise to a high of 63 per cent in 1954.

The decline of share of own account construction work coexisted with a growth in absolute value for this period. Total own account construction expenditures, in current dollars, grew at an annual rate of 3.9 per cent over the two decades. The subsectors grew also, in current dollars, at an annual rate of 4.1 per cent for utilities, 5.3 per cent for governments, and 2.2 per cent for the residual "other" category of buyer. New construction expenditures grew at an annual rate of 4.7 per cent over the period while repair construction grew at 3.7 per cent.

What does this mean? Well, first of all it means that the share of the contracting sector in total construction,

and in each type just discussed, grew. It also grew in absolute values. The trends have been clear. Certain shifts in some management practices have occurred, such as the use of management teams or project managers (to be discussed later), but the basic features inherent in creating the use of a contract form of doing business, must have been shifting to a relatively stronger position over the period. Such trends require that these reasons, and more importantly the implications of contracting, be investigated. This sector is clearly the most important in a relative sense for construction activity in Canada.

What is the Contract System?

The contract system operates along the following pattern. A buyer decides upon a project and specifies it in extensive detail. Then these plans are made available to potential builders by one of the methods discussed elsewhere with regard to bidding. The buyer chooses the most suitable builder, usually by reference to price, and a legal contract is arranged to complete the project to specifications. The prime contractor, the one taking responsibility for the whole project, is usually called a general contractor. Since the prime contractor does not usually possess all the skills and equipment that may be needed, he will seek bids from other firms for special sections of the whole project. These others, classed as subtrades, become linked by a legal device called a subcontract. Subcontractors can also arrange for others to meet special needs and a series of layers can evolve. Each stratum of this intertwined pattern is like a stage of production in the context of the project. Each contract is very specific in terms of many details and is the legal device

linking the stages of production. It is a market transaction that determines which firm obtains any particular contract, or subcontract, but once it is formed then the integrated stages of production must co-operate to complete the project.

What is a Contractor?

A construction contractor is a person or firm which agrees for a stipulated price or fee to construct a specified project. The contractor is not an employee of the buyer of the project and is hired exclusively for the purpose of the project. At the completion of the project the relationship and activity cease. This study is not concerned with the many specific legal implications of this status but with the economic reasons for and implications of this status, and this pattern of behaviour, especially the inconstancy of the buyer-contractor and contractor-subcontractor relationship which has been termed a pattern of temporary vertical integration.

Why a Contractor Sector At All?

Another way to phrase this titled question is to ask why is more, or most, construction not done on an "own account" basis. Yet another context is that of the make-or-buy decision for the services of builders. Why does a buyer not integrate into construction as a branch or subsidiary? Basically the rationale explaining why an industry adopts the contract system is based upon the forces in the market mechanism that design or induce specific market structures and practices. In this context it will be features of the demand pattern, the technological conditions, and in some ways the motivation of the entrepreneurs that combine.

Economic theorists have spent much energy on explaining how firms are expected to behave in relation to each other when competing for the same markets but the questions about why firms exist as particular entities have, until quite recently, been skirted.[2] These important questions can also be asked in terms of the extent of integration of firms within the context of a production and delivery system.[3] The construction case can be interpreted by switching the question and asking why fully integrated firms do not exist in this industry.

The reason why these questions are being examined here is more than academic. Some policy proposals that have floated around have been based on implicit assumptions that the construction industry is not as well off as it could be because of a "fragmented" or non-integrated structure, and that a change in this structure can both make the industry better off and reduce cyclical impact. None of these assumptions is supported by this research.

A "firm" can be described as one of the basic operational economic units. Its functions are several, including the integration, control and monitoring of inputs, outputs and rewards to factors of production.[4] Managers of

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[2] The seminal article was by R. H. Coase, "The Nature of the Firm", Economica, Vol. 4 (November 1937), pp. 386-405, which is reprinted in G. J. Stigler and K. E. Boulding (eds.), Readings in Price Theory, Homewood, Illinois, 1952, pp. 331-351. The new and recent contributions are those in the several footnotes that follow in this part of the discussion.

[3] An interesting, and somewhat ignored, contribution on vertical integration is H. H. Baligh and L. E. Richartz, Vertical Market Structures, Boston: Allyn and Bacon, 1967. It is only theoretical but quite interesting.

[4] These informational dimensions are the main theme of A. A. Alchian and H. Demsetz, "Production, Information Costs, and Economic Organization", American Economic Review, Vol. 62, No. 4 (December 1972), pp. 777-795.

firms, that is the entrepreneurs in the simple theoretical model, are the ones to whom the residuals from activities accrue (whether profit or loss) while the other factors receive prespecified rates of pay or remuneration. The entrepreneur bears the cost of the risk and is presumed to operate for the motive of profit or some combination of profit and other utility-creating events.[5/] Unlike interfirm relations which operate on the basis of explicit markets, intrafirm relations operate without such a direct recourse to market transactions. The boundary of the relationships within which one has a firm then can be described by reference to the role of explicit market interaction and explicit market prices.[6/]

In the context of construction we observe firms of two basic dimensions: one, which will now be described with the small case letters, "firms", and generally coinciding with special trade contractors, and two, which will now be described with an initial capital, "Firms" which generally coincide with the amalgamations of a set of "firms" necessary for each construction project. Each "firm" carries on with a specific task (e.g. install electricals) in a complete project (e.g. an apartment building). The existence of the "firms" is

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[5/] For a recent review of the "motive" literature, see R.M. Cyert and C.L. Hedrick, "Theory of the Firm: Past, Present, and Future: An Interpretation", Journal of Economic Literature, Vol. 10, No. 2 (June 1972), pp. 398-412.

[6/] O.E. Williamson, "The Vertical Integration of Production: Market Failure Considerations", American Economic Review, Vol. 61, No. 2 (May 1971), pp. 112-123, and "Markets and Hierarchies: Some Elementary Considerations", American Economic Review, Vol. 63, No. 2 (May 1973), pp. 316-325 follow Coase, op. cit., with this definition of the boundaries and explanations of the existence ans scope of activities of firms. See also G.B. Richardson, "The Organization of Industry", The Economic Journal, Vol. 83, No. 327 (September 1972), pp. 883-896. The subject was the topic of an unpublished speech by J.K. Galbraith to the annual meeting of the Canadian Economics Associations, Montreal, June 4, 1972. Special skills, and geographic dispersion were the main points discouraging "Firms".

explained easily with reference to the theory while the absence of construction "Firms" is explained by the absence of factors inducing integration. These influences will be reviewed under the headings of technical conditions and demand patterns. Some reference should also be made to the incentive patterns as seen by actual entrepreneurs, for these too from the other side of the market act to encourage the contract system.

Technical Reasons

Each project consists of a series of tasks; each task may be viewed as a stage of production in the system that builds the final product. Integration will be encouraged, or more economically justified, when certain technical features exist for the product and the production process. The ultimate effect of integration is that total costs are reduced, as contrasted with an unintegrated pattern, but the technical reasons are the source of this cost pattern.

Joint production, by technical necessity, is the most obvious case of integration into a firm. This is the case where the only possible result of the working of the particular resources is the combination of two products. An example is the spectrum of petrochemicals produced by a refinery. Such technical features do not exist in construction and thus do not act to induce integrated stages of production into "Firms". This point is raised only to make the discussion complete.

Other technical features can make the integration of stages of production under one managerial unit significantly less costly, if not technically necessary. The standard example is the rolling mill and the blast furnace in steel making. Here the cost of reheating the metal

precludes an economic solution to a non-integrated plant. Such technical features do not operate to induce integration in the construction case.

Another possible case of technical inducement to integration is economies of scale in one stage of production. An historical example noted by Williamson[7] was the development of important centres of motive power in the British weaving industry. Introduction of steam engines that raised production rates significantly induced the dispersed cottage industry structure to integrate into centralized factories. This phenomenon has many more recent examples but not in the case of construction.

It is clear that none of these types of technical constraints induce construction firms to integrate the several stages of production under one management. That means technological factors permit the structural pattern of many specialized "firms" rather than a fully integrated "Firm". The other factors allow this permissive situation to exist in fact.

Demand Patterns

Several dimensions of product demand can act to produce important incentives for stages of production to be integrated under one managerial unit. These will be set out below as features favouring such integration and it will be seen that they do not obtain for the case of construction, thereby leading to the suggestion that demand features promote the contract system and a non-integrated structure. No factor

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[7] O. E. Williamson, op.cit. (1973), pp. 323-324.

alone is sufficient of course, but when enough of them cumulate in importance the managers may well decide that integration is more efficient than the continued recourse to market transactions of the buying out by contract system.

If the contacts between stages of construction are frequent, and more particularly if the contacts between specific members of each stage are frequent and stable, then there is an inducement to integrate. The general use of low bid selection makes this unlikely in construction. In terms of time very few purchasers of construction services have a demand that is regular. Usually the demand is only intermittent and the time gaps between succesive purchases are long. In terms of space, seldom does any purchaser, who requires several projects, want them in the same locality. And, in terms of the input mix, this too is frequently an item of major qualitative difference. There are, of course, exceptions to these sets of conditions, but they are, by definition, those few places where the "own account" construction exists.

The relative size of the contacts can influence integration. If, for example, one firm in the upper stage gets its entire supply from one member of the lower stage or the firm of the lower stage supplies most of its output to a member of the upper stage, there will be some incentive to simplify the contacts by vertical integration. Likewise, if the upper stage gets a very vital basic resource from the lower stage, there will be some strong inclination to merge. These forces operate both at the firm and the industry level. Seldom do these conditions obtain in construction, and although some projects may create a temporary presence of them, the effect is not enough to form integrated "Firms".

A small number of producers at any particular stage, either due to scale economies or market power and oligopoly, can be an inducement to integration. Part of the impact of the stronger market power is that it can extract monopoly profits; integration can allow these to accrue in a different distributional pattern. Such a set of conditions is not found in construction where there are many producers, or "firms", at each stage of production.

Product qualities in the demand pattern can also be factors inducing integration. Where it is important that the flow of supply between stages is certain as to timing and quality, then a desire to reduce the risk of delay or inadequate supplies can induce integration. These factors exist in construction but are not sufficient on their own to warrant integration of the several stages of production.

Sometimes access to the product has been seen in the context of control and information[8/] The desirability of readily available, trustworthy and timely information can induce integration. In construction this dimension is not very strong because the project specifications are known well in advance of actual construction activity so no inducement arises in this manner.

Entrepreneurial Incentives

There are some clear incentives from the point of view of the entrepreneur that make him prefer the flexibility of the contract system. The specialization of skills and

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8/ See R. Radner, "Problems in the Theory of Markets Under Uncertainty", American Economic Review, Vol. 60, No. 2 (May 1970), pp. 454-460; and Williamson, op. cit. (1971), for the development of this theme.

capital make it difficult for the "firm" to diversify. If the owners of these resources want to keep the idle capacity at a minimum, which is quite reasonable in a free enterprise capitalistic economic system, then they want the practical ability to move around as their particular tasks come into demand. These entrepreneurs must seek a chain of projects wherein their tasks are demanded. If they had to rely on being mere components of large permanently integrated "Firms", then the flow of projects to such a "Firm" would not easily provide a time flow of tasks in which optimal utilization would exist. The scheduling problems for a centralized management would be substantial of course, but that is not the real impact. Rather, the costs of idle capacity would be borne by the owners of the integrated "Firm". They would seek to minimize this cost by use of the temporary contract system, if they existed. Whoever the owners of this capital however, they would minimize these costs by having the flexibility to hire on contract and/or by having the flexibility of being available on contract. While it cannot be tested empirically, it seems reasonable to suggest that normal market incentives operate to minimize idle capacity at a minimum. This is done better with a structure of many specialized, flexible and floating firms that are mobile from project to project and use market incentives rather than central scheduling to arrange them.

Summary

In sum then, the technical features of product and production processes that induce integration in other industries are not effective in construction. And, almost nothing on the

demand side of the market gives advantage to an integrated firm over a disintegrated set of firms. The effect then is to reinforce the other factors supporting, or permitting, a construction industry of many specialized independent firms and the basic pattern of vertical integration that can best be described as temporary and intermittent. This flexible and fluctuating structural element, along with the wide dispersion by size and the extensive technical specialization, is quite reasonable and understandable in the face of operational conditions in the construction environment. Each and all of these patterns can be expected to continue in the future.

3.4 The Structure and the Cycle

Chapter 2 specified the basic policy issue of concern as the construction cycle. Other evidence has shown that there are three important components to construction: government, industrial and commercial, and housing. This section addresses itself to the main policy questions, often in the context of one or another of each separate part of the total construction activity.

The Questions

Concisely we are asking if the cycle has caused some part of the structure among the suppliers, and if the structure has caused some change in the extent of the cycle. The previous sections have answered the first side of the question by explaining and describing the dominant influences on the main components of the structure. Specifically it is

held that technical features of the product and production process plus a series of dimensions of demand permit a flexible structure with many firms of many sizes and diverse but specialized activities. The presence, or the absence of a cycle is quite unnecessary in the explanation. And, more importantly, the existence of a cycle does not alter the type or extent of any of these major structural features. Thus we can move to the other type of policy-oriented basic question, that of asking if the structure alters the cyclical size or scope.

The size of a cycle has been described with reference to the amplitude of the deviation from the trend and the duration of the boom or recession. Thus the specific questions relate to the structure's impact on the level of the peak, the level of the trough, and the duration of either.

Influences on Demand

Reference to the major influences on demand is important. Companion studies have generally supported capital stock adjustment models to explain construction cycles.[9/] This means that, among other influences, the expectation of returns or utility induces the timing of calls for tenders to provide construction activity. Price elasticities have, in general, been "low" and other elasticities have been "high", which means that the important variables are not within the realm of the construction firms to modify. For example, personal income, interest rates, tax revenues, and the availability of mortgage funds are not part of the economy that are thought to be influenced by construction firms.

9/ See studies by N. M. Swan, J. H. Chung, and L. Auer, background studies in the series related to the Reference on Cyclical Instability in Construction, Economic Council of Canada, forthcoming.

Another possible way that an industry might influence demand is by advertising or marketing activity. Can the construction industry reasonably be expected to expand purchases of their output, as an industry and not merely shift market shares? The answer is negative, for two main reasons. First, standard practice chooses a builder after a building has been decided upon. Often it is done by a bid tendering process. In such a case any firm that sought to obtain a contract by sales promotion, other than effective bidding, would still have only a partial probability of getting the contract. Of course that situation applies to all advertising and promotion. The difference here is that what is typically considered advertising is inoperative in the construction market. Buyers select on other more sophisticated and relevant criteria. The second reason is a variation of this. With a structure of many specialized firms, none of which constitutes a large share of any typical project, the probabilities of one firm, even one sector, influencing aggregate demand are reduced even further.

From these points of view then, it is apparent that construction firms have no appreciable impact on the flow of demand whether regular or cyclical. The mere existence of firms, even with easy entry, does not mean there is an output of production. Resources can and do sit idle unless factors other than the industry's firms have effective demand for construction activity. There is however another possible dimension to look at.

Output or Sales?

The flow of sales is not necessarily the same as the flow of output. The difference between them will show up in excess demand or excess supply. Excess demand will result in some combination of price rise, and a queuing of unfilled orders. Excess supply will result in inventory accumulation. What is the capability of the construction industry to build inventories

and force queuing backlogs as a conscious policy to modify the flow of their output when it does not watch the flow of demand?

Both of these buffering techniques are common indicators of business activity in economic analysis. Both of these are also devices that are considered by plant managers in their regular activities. If for any reason there are economies to a more even flow of output than sales would elicit then one or both of these devices can be called upon. However, we must see if this is true or relevant for the construction industry. Are they possible technically? Are they likely to arise from the industry itself?

At this point we will consider the questions in the context of the current structure. Later a possible revised structure, a controlled-entry structure, will be considered because this has been a proposal arising for evaluation in the context of this Construction Reference.

Stem the Tide?

First, consider the technical problems with the industry slowing down the boom as a contracyclical policy. What tools does it have? When excess capacity exists, that is when a supply of labour, capital and management is available, the entrepreneurs' response to calls for tenders would have to do something to stem off that demand. One tool is to use "excessively high" pricing so that the buyer will reconsider his pending purchase. Another tool would be a simple refusal to supply tenders. The questions about these tools have to be as follows. Why would the industry want to use them? Are they likely to arise? With excess capacity, a profit-motivated system, a competitive structure and easy entry, the likelihood of any such policy being aimed at is next to nil.

Price elasticities of demand would make "high price" bids of small impact because if the buyer felt the first bids were too high he could just callfor another set of bids and expect competition for the business to respond appropriately. The whole constellation of the market precludes effective boom restraint policies by the construction firms. And, additionally, if the industry did collude to restrain trade they would run into direct opposition to competition policy in the form of the Combines Investigation Act, which makes retraints of trade and collusion illegal. It would only be the arrival of real capacity constraints from the industry side that will put a ceiling on the booom. As a judgment I would propose that this is the way it should be, but then I believe the industry's role is to serve the buyers' demands as best they can when these demands arise.[10/]

Fill the Trench?

The other side of the cycle is the trough. Can it be raised by actions of the construction industry? What tools are available to them? Could they work?

The trough is, by definition, a time of excess capacity. One could expect then that competitive pressures would be stronger than in the boom. Price elasticities tend to make the impact of lower prices, arising from the competition and making what economists once called the Pigou Effect, inoperative.[11/] Sales promotion such as advertising have been rejected. The only remaining tool would be the use of inventories built in the trough for later sale. What of this policy tool? Can it work for construction firms?

10/ A study of productivity in the construction industry by M. R. Prentis, Economic Council of Canada, forthcoming.

11/ This Pigou Effect postulates that low prices will cause a sizeable increase in the quantity demanded and pull the recession back out of itself.

Two major problems make inventory accumulation inoperative as a viable contracyclical policy to be used by the industry. First is the economic incentive pattern. What incentive would construction firms have to build inventories? As purchasers of the resulting stock for speculative purposes, i.e. inventory holding, they would have no more incentive than any other buyers. Capital would be tied up in idle projects with insufficient expectation of having these costs recovered. This is the same reason others are not buying and the construction firms are no more isolated than others from these economic realities. The disincentive is augmented by the structure of the industry into small firms that would not be able to get capital as easily, but that extra margin is beyond the limit where the decisions were made and has no impact for even the availability of capital to other potential buyers makes the present value of many investments less than zero. This latter fact is the reason for the trough after all.

In some cases there are incentives arising because the cost of idle inventory accumulation is less than the cost of idle plant capital, including the possible complete depreciation of it and the loss of skilled workers who will be not available later when an up turn arises. Do these exist in construction? Labour hiring practices do not involve significant permanent personnel and irregularity of employment is a situation in this industry. Managers place the idle capacity costs on labour quite generously when they have the chance. From the capital side they disperse their own costs of idleness by the frequent use of leases for equipment. And, once a boom is over much of the equipment will have been depreciated anyway. Certainly these influences exist, but not enough to create inventory accumulation by the construction industry.

Secondly, and really the crucial determinant of the failure to observe accumulations of inventories of construction projects by the industry is the technical factors which make the practice near to impossible. Consider first the kind of projects bought by governments, items such as bridges and roads and sewer systems. Governments as purchasers can buy them and leave them idle or underutilized but inventories of them on hand by construction firms are simply not possible. And, it is important to note that while inventories of materials might be kept these are related to the output of suppliers rather than construction firms. Basically the same problem exists for factories and other commercial projects. They are not mobile and so construction firms cannot keep stocks of them for potential buyers. How, for example, does one build a factory on A's property hoping that A will buy it later? The possibility is reduced even further, from initial levels of impossibility it must be noted, when one considers the specialized nature of firms in construction. One firm, say an electrician, can keep material inventories, but he cannot keep stocks of installations without stocks from the other specialty firms too. Housing is also in the same situation for reasons of access to the final site, subject only to the use of "mobile homes". This market, now about 25 per cent of the American market but only 10 per cent of the Canadian, does permit inventories of partially completed construction. It is not likely to be a major hope for aggregate housing stabilization however while at these levels of significance.

Conclusion

What does this lead to as a conclusion? It suggests quite clearly that the industry is impotent to modify the cyclical flow of output on its own. Technical facts make it a practical impossibility to hold inventories. Economic forces make these dubious investments in addition. Restraint on the

upswing will be inconsistent with the profit motive's operation and with the laws that promote competitive efficiency. The construction industry will track the shifts in demand with rapid accuracy having only minimal lags in an upswing, until full real capacity is reached, and no modifying affects on the downswing. It is an industry which can only react.

What if Fragmentation Reduced?

If the "fragmentation" of the structure, a term encompassing the variety of firm sizes, especially the smaller firms, is not the cuase of cyclical amplification then a review of the effect of reduced fragmentation is not necessary. However, it may prove useful to look at the question anyway. Will a smaller number of firms (to be distinguished from a reduction in available capacity) reduce cyclical instability? Empirical testing of this for construction is not possible so we must turn to the well established procedure of specifying the mechanisms by which a change might come about and then applying professional judgment to see if the possibilities are credible expectations.

If a structure of fewer firms was to be achieved it would imply more rigid entry requirements and inducements to consolidation. In order to modify the cycle the firms in such an oligopoly structure would have to operate in the same ways as were just specified for the current structure, that is by promoting demand for construction projects, by reducing available capacity in an upswing, and by producing for inventory in a downswing. Could an oligopoly industry do any of these activities better than the firms operating in the current structure? It is the judgment of this researcher that no reason exists to make him believe an oligopoly system would have any more

effective ability to operate as required to modify the cycle. The conditions that block this possibility from a fragmented industry would block an oligopoly equally.

The policy implications of this conclusion are clear. Policies to eliminate small firms, to amalgamate current firms, or to control entry will be neutral in their impact on the construction cycle. Other effects may accrue but not with importance for cyclical stability.[12/]

Conclusion

Concisely, the findings of this research are that the cycle is not important in explaining the main structural features of this industry, that the structure of this industry is not affecting the cycle, whether by modifying demand or by buffering the demand fluctuations by withholding supply in booms and building inventories in slumps. In addition, no change of the structure would change the inability of the industry to modify the cycle. As a policy conclusion then the only honest answer, for contracyclical purposes, is to leave the structure well enough alone.

Next, certain other structural features will be commented upon.

3.5 Other Structural Features

Two other structural features warrant some brief discussion at this point, a development called project management and the evasive concept of""firm capacity"in this industry.

12/ These other effects might be changes in problems such as poor workmanship and debt payment patterns which are alleged to be the fault of small "firms". But that is another set of problems and quite independent of cycle.

Project Management

Project management is a variation on the contract system and structure. Under it the use of a "general contractor" to supervise the project and hire the subcontractors is altered. The actual function is still carried out but rather than being done by a contractor who bears the risk of errors on the bidding estimation it is done by someone with an employee status. Some have suggested that this development is critical, and for some projects they are correct. Most of the impact, however, is on costs with specific relation to management efficiency. Some cyclical impact could exist but only in the upturn. The project management system can permit a reduction in the delay between deciding on a project and actually getting it underway. However, this is not peculiar to project management as a technique because the regular contractual arrangements can permit rapid start up on a project if the buyer is willing to negotiate for such provisions under the current contract system. In conclusion then there is little contracyclical impact to be expected from any expanded use of the project management system.

Capacity

Capacity has always been an elusive concept. Generally it means a maximum rate of output that can be expected but in practice this is tempered towards a rate deemed to be an optimal rate of output. Whatever it is it is a conditional concept, that is the capacity rate must be defined with specific reference to such constraints as the number of shifts, the acceptable rate of wear on capital machinery, the use of overtime, etc. Even with such a specification, however, can we define capacity rate for a construction firm? Does this concept have any meaningful role in the construction industry? The answer is an ambiguous yes-and-no.

The reasons for the affirmative answer rest in such situations as the capacity of management to supervise a large number of construction projects and the unwillingness to obtain working capital and surety bonds because these industries deem a firm to be "overextended".

The reasons for the negative part of the answer rest in the elasticities of supply that exist for any specific firm if it has the contracts. After all, the sales size of a construction firm is really the sum of its contracts. Because contracts can come in lumpy increments of large size it is quite possible for a firm to double its "size" by just one more sale. Assets in terms of capital goods do not act as a significant constraint in the construction industry. Leasing is common, on a short-term basis, so a new contract just creates a capital aquisition program of a temporary nature. And, in addition, the use of subcontracting also enables a rapid increase in total billings to be handled by a construction firm. Retraction to a smaller "size" is also quite easy. With such rapid access to the physical capacity to handle major changes in contracts one finds it next to impossible to quantify the "capacity" of a construction firm in the manner one might for a manufacturing plant or firm.

The effect of this ability to accept major changes in total business is another interesting structural variable that is exhibited by this industry. It arises from the contract system and certain technical factors. It is not related to the cycle as a causative factor, nor as an effect. The change of "capacity" is rather related to shifting market shares. Some numerical evaluation of this is presented later in Chapter 4.

CHAPTER 4

SPECIFIC STRUCTURAL FEATURES

4.1 Introduction

There is data available on only part of the Canadian construction industry in detail that provides possibility for analytical insight. Specifically these are the electrical contractors, the mechanical contractors, the highway, road, street and bridge contractors, and the unincorporated sector of the business. Missing from this list are such groups as the residential contractors, the general contractors and several other groups about which we should know more from formal data sources.

Data History

A few comments about the history of construction industry data collection by government agencies is in order. Until 1951 a Census of the whole industry was made by the Dominion Bureau of Statistics (D.B.S.), now Statistics Canada (StatCan). Then, for unreported reasons, the procedures were changed and a small sample replaced the Census. It asked only a minimal number of questions related to the division of costs between labour, material and the residual "other". The sample was not scientific and not kept up to date properly. It probably served its minor intended purpose adequately but that is all. After examining it I have concluded that it is definitely not suitable for any analysis of the structural features, especially exit and entry patterns and size distributions. To use it for that purpose would be seriously misleading.[1/] Recently this situation has begun to change. StatCan is in the process of

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[1/] Table 4.7, compares how the sample taken in 1967 represents the true population as determined by 1969 data which is based on a Census. The dramatic shift in the distribution of firms by size is to be noted.

introducing an industry census for the construction industry again. It began in the middle 1960s and has been gradually in the process of developing. Now, in early 1973, three groups are at the "full census" stage and two or three others are pending. Those available are the first three discussed in detail here, the electrical, mechanical, and roadway groups. Residential and "general" contractors are now nearing introduction. First years of the censuses have proven them to be incomplete but the whole industry should be covered by 1975. And, fortunately, the questions now being asked are more extensive in scope so that a more meaningful picture of this industry's structure can be made available to the public.

Subindustry Selection

Were the specific subdivisions of the industry, as used by StatCan, the most suitable? Considering the extensive review of possible criteria as presented in Chapter 3 one has to consider that the selection was the best mix for practical and analytical purposes.

The one other major option is not at all as helpful. This would have been a simple bifurcation into "General" and "Trade" contractors. Unfortunately for that division the term "general" too often means "Jack-of-all-Trades" and data on them muddle up all of the other useful

distinguishing criteria. And, even by subdividing the "Trade" category down we still find an extensive range of product types and predominant reliance on the skill criteria which, while very important for labour market studies, leaves us too little of the valuable product information. In the final analysis it should be done all ways of course, but that cannot be done because data collection is a costly process. As a result, we have the mixture of criteria, but a well selected one with subsidiary questions that permit other useful subdivisions. Now we will look at these in the following order: (1) road, street, and bridge contractors, (2) electrical contractors (for all kinds of projects), and (3) mechanical contractors (for all kinds of projects). The unincorporated sector is a generalized collection to be discussed later.

Indicators Reviewed

There are many specific items of data collected in the census of the construction industry, but only some of it is useful for structural analysis. The data to be discussed here relate to the following indicators. What do they indicate? What do they not indicate?

Size Distribution

The distribution of firm by "size", bearing in mind the utility of billings as a sign of capacity as discussed at the end of the previous chapter, is the standard major structural feature. Usually this emphasizes the level of concentration of business among the few largest firms and is one rough estimate of the level or degree of competition in an industry. One must use it cautiously, and in conjunction with other indicators, but in general the higher the degree of concentration, i.e. the more share that the fewest and largest firms have of the available business, the less competitive is the industry. A special caution arises for construction which does not show up in this data. It concerns the fact that not all competitors bid for each job, even on a local level, and thus concentration data provide maximum estimates which may not hold. Also, with bid systems operating to make each producer's price a secret, single time offer, the flow of market information is impeded from what it might otherwise be. Information awareness is a vital part of competition. And, after all, competition is the practice our system relies upon to get most of its economy operating at efficient levels.

Gross Markups or "Profit"

Data is available on the markup or gross profit of firms in the industry. It is broken down by size group and shows sizeable differences. This figure is "revenues minus costs", with those "costs" not always including a proper wage to the proprietor in those sectors where this legal form of business is most common. This measure has on occasion been used to

measure the degree of competitiveness,[4] but other factors can account for it including poor accounting procedures. Both possibilities are reasonable but a conclusive test has not been found. It should be noted explicitly that gross margin does not measure profit on equity or profit on total capital.

Other Indicators

The age distribution of firms showing length of time in the business and size is available in some cases. This can show some things about the characteristics of durability of firms, growth potential, chances of failure, and exit and entry activity.

The number of salaried employees is noted. I would not want to make too much out of this interesting internal structural feature. It does not mean that real stability is imparted to the firm as much as that regular payment procedures differ in different sectors of the labour market. It does not indicate good or poor quality workmanship if one has "real salaried managers". What it may best reflect is the reliability of the data improves with full-time accountants.

Subcontractors really work for some other contractor. The more a firm subcontracts out the less diverse its skills inside its own plant and equipment. More subcontracting usually goes with larger and more complex projects. For example, a very

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[4] The "Lerner Index" is the main example. For a review of these measures, see F. M. Scherer, Industrial Market Structure and Economic Performance, Chicago: Rand McNally, 1970, pp. 50-57; W. G. Shepherd, Market Power and Economic Welfare, New York: Random House, 1972, pp. 24-33; and the Department of Consumer and Corporate Affairs, Concentration in the Manufacturing Industries of Canada, Ottawa, 1971, pp. 7-12 and 269-274.

general contractor may just oversee a large series of subcontractors. This figure, when large, reflects an "average" upper level position in the vertical integration hierarchy for that firm. But only extreme values mean much with precision. High values indicate more general contractors; low values indicate more specific trade contractors. The status as "prime" contractor indicates an immediate contact with the buyer. When small firms have this it is an indication of repair work, especially if the amount of subcontracting is very low. These two indicators show that there is a vertical structure as presented earlier.

We now turn to the specific cases.

4.2 The Highway, Road, Street and Bridge Contractors

This group is selected using the final product criterion. Both the specialization of capital equipment and the output criteria could have identified an equivalent group of entrepreneurs but the final product distinction is more useful. How significant are they? How concentrated are they? What can we tell from other available indicators?

The construction, repair and maintenance of highways, roads, streets, and bridges totalled $1.4 billion in 1970, an amount which represented about 10 per cent of the value of all construction. An industry census report is available to provide certain data on those contractors which did about 65 per cent of this work. However, it is only useful for a single cross-section study because this census only began in the year 1970. A very restricted time series analysis is possible, for the period 1958 to 1969, based on an industry survey that was being made at the time.

1) The Time Trend Data

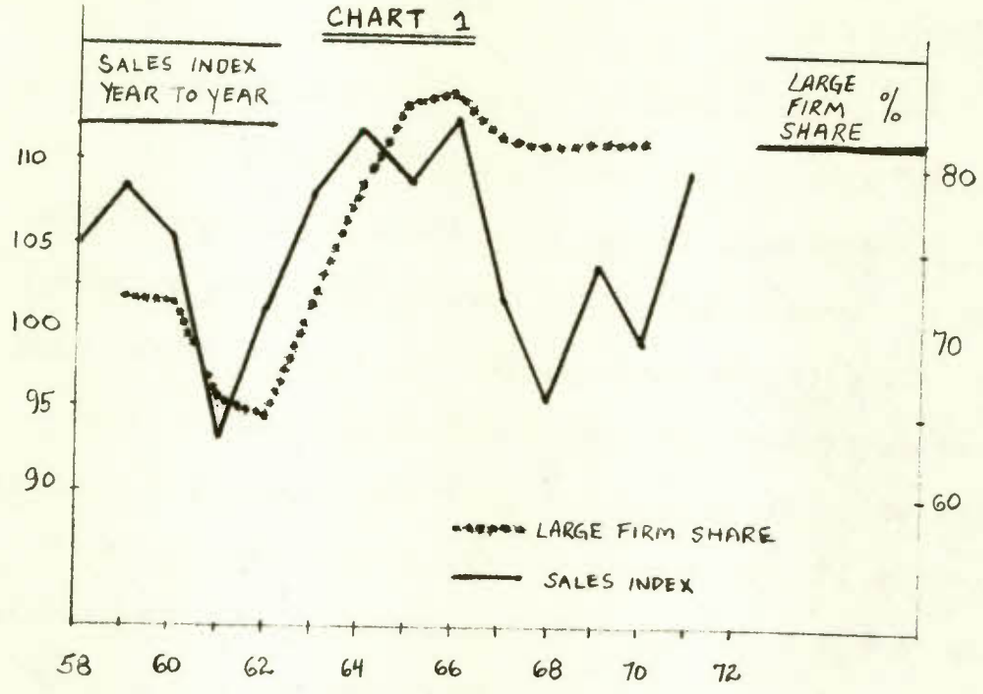
During the decade 1958-68, a sample survey was made of the highway contractors. While the survey was large enough to be considered nearly a full census, the real proportion of the population it represents is not known. Also, the actual sample size altered from year to year in ways not well related to population changes, and partly due to response rate changes. Thus shifts in absolute values are of unknown statistical significance. Also, the scope of its questions was very narrow. In spite of these major deficiencies one trend can be discussed, the share of business held by "large" firms. These are presented in Chart 4.1 below. "Large" firms are those which had in excess of $1 million dollars of work done by their own labour force, that is excluding sub-contracting costs. This distinction is only a moderately acceptable class limit. A finer breakdown of the large firms would be better since as more recent data shows, about 5 per cent of the firms now have sales over $5 million. However, this is all that we have now so we must do with it.

First, this graph shows that the share of business by "large" firms is increasing over time, from roughly 70 per cent in 1959 to 80 per cent in 1970. The big jump came between 1962 and 1966. Much of this rise could be due to inflation because the implicit price deflator for highway construction rose from 0.996 to 1.286 over this period. Also involved is the particular lower level for the upper size class. Just one large project can create a major shift in the size group

for any firm, even putting it into the "large" category. A more detailed examination of the short period when the substantial increase occurred will show more.

From 1962 to 1965 the internal pattern among the size classes showed that number of "small firms" (those with sales under $300,000) declined. It is proposed that this mostly represents shifting of sizes and not real new entry or exit. These facts along with a reported growth in work performed, by 56 per cent, supports the contention that the shift is primarily due to the size of the new projects and the particular size class used to identify "large firms". Similarly, a look at the two pair of years when sales fell in two adjacent years, the next, specifically 1959-61 and 1966-68, tends to indicate that the decline in the share of total business to "large firms" was largely the result of shifts downward in size rather than due to exit.

Generally the foregoing is not very conclusive about the effect of changes in business volume on the degree of concentration. The apparent change has to be viewed with much scepticism, possibly with enough to conclude that no change came about. And, such a result is a weak guide to policy making in terms of cyclical relevance. We really would need better evidence of the facts. However, even then they may indicate little that is important.



2) The Cross-Section Data

Detailed data from the census of the highway, road, and bridge contractors is available only for the year 1970, the first year of the census.[5/] Some interesting figures can be examined to measure cross section structural features by size of firm although this cannot tell us anything about the cyclical relationships.

[5/] Source: The Highway, Street, and Bridge Contracting Industry, 1970, Ottawa: Statistics Canada (Bulletin 64-206), annual after 1970.

Concentration

Concentration data in terms of the numbers of firms and their share of business by size groups is set out below in Table 4.1. Note that there are more large size classes here than in the previous data. It is evident that this industry is not very concentrated nationally. The largest 15 per cent of the firms control 65 per cent of the business but these firms number 101. At the other end of the scale the 112 smallest firms represent 16 per cent of the firms by number yet they handle less than 1 per cent of the business value. The implications for restricted competition from this pattern are not extensive, at the national level of market size, but this is not really the level where competitive forces operate in this particular sector of the construction market so we must look at finer breakdowns in regional markets.

Table 4.1

CONCENTRATION OF BUSINESS AMONG THE HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS, 1970

		SIZE GROUP BY SALES ($000)								
	Total	0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over to 5000
All Canada										
Firms -- number	684	112	140	115	86	38	58	34	67	34
-- percentage	100.0	16.4	20.5	16.8	12.6	5.6	8.5	5.0	9.8	5.0
Revenue -- value ($000)	907,700	6,926	25,579	46,799	58,957	38,375	78,694	66,486	230,473	355,411
-- percentage	100.0	0.8	2.8	5.2	6.5	4.2	8.7	7.3	25.4	39.2
Atlantic Provinces										
Firms -- number	70	3	13	11	8	*	14	5	9	7
-- percentage	100.0	4.3	18.6	15.7	11.4		20.0	7.1	12.9	10.0
Revenue -- value ($000)	136,468	182	2,591	3,732	5,120	*	16,286	8,529	32,238	67,790
-- percentage	100.0	0.1	1.9	2.7	3.8		11.9	6.2	23.6	49.7
Quebec										
Firms -- number	116	10	16	18	26	10	10	7	14	5
-- percentage	100.0	8.6	13.7	15.5	22.4	8.6	8.6	6.0	12.1	4.3
Revenue -- value ($000)	170,486	752	3,035	7,558	16,739	9,530	13,202	13,500	44,125	62,045
-- percentage	100.0	0.4	1.8	4.4	9.8	5.6	7.7	7.9	25.9	36.4
Ontario										
Firms -- number	195	18	32	35	22	16	22	13	25	12
-- percentage	100.0	9.2	16.4	17.9	11.3	8.2	11.3	6.7	12.8	6.2
Revenue -- value ($000)	355,279	1,214	5,986	14,845	16,613	16,994	32,674	26,341	89,420	151,192
-- percentage	100.0	0.3	1.7	4.2	4.7	4.9	9.2	7.4	25.2	42.6
Manitoba										
Firms -- number	50	20	13	6	5	--	*	3	*	3
-- percentage	100.0	40.0	26.0	12.0	10.0	--		6.0		6.0
Revenue -- value ($000)	34,414	1,118	1,961	2,435	3,346	--	*	4,471	*	21,083
-- percentage	100.0	3.2	5.7	7.1	9.7	--		13.0		61.3
Saskatchewan										
Firms -- number	78	18	24	12	10	5	*	5	4	--
-- percentage	100.0	23.1	30.8	15.4	12.8	6.4		6.4	5.1	--
Revenue -- value ($000)	44,273	1,198	4,329	5,121	6,945	4,912	*	7,644	14,125	--
-- percentage	100.0	2.7	9.8	11.6	15.7	11.1		17.3	31.9	--
Alberta										
Firms -- number	86	24	23	13	9	*	3	3	7	4
-- percentage	100.0	27.9	26.7	15.1	10.5		3.5	3.5	8.1	4.7
Revenue -- value ($000)	79,556	1,461	4,181	5,005	6,157	*	3,593	5,723	24,379	29,058
-- percentage	100.0	1.8	5.3	6.3	7.7		4.5	7.2	30.6	36.5
British Columbia										
Firms -- number	89	19	19	20	6	3	8	3	*	11
-- percentage	100.0	21.3	21.3	22.5	6.7	3.4	9.0	3.4		12.4
Revenue -- value ($000)	87,224	1,001	3,498	8,103	4,037	2,927	10,572	6,657	*	50,429
-- percentage	100.0	1.1	4.0	9.3	4.6	3.4	12.1	7.6		57.8

* Information has been added to next higher column for secrecy purposes.

Source: The Highway, Street and Bridge Contracting Industry, 1970, (Statistics Canada Bulletin 64-206).

In 1970 provincial contracts provided 43 per cent of the business (at $392.7 million), municipal contracts 20 per cent (at $185.3 million), federal and private roads 11 per cent (at $101.5 million), and various bridges at 6 per cent ($53.6 million). The balance came from a mixture of parking lots, sewers, airport runways, and such. The nature of these buyers, being local and provincial governments who just may give some kind of preference to local firms, adds to the significance of local markets. Good data indicating interprovincial competition is not available, but it is general practice to operate in regional markets. Thus, a series of concentration data for the several regional groups is also presented.

Regional breakdowns are available for concentration patterns. They are presented on Table 4.1. Here, where the figures are more meaningful than nationally some quite different patterns emerge. Manitoba had 61 per cent of its 1970 sales shared by the three largest firms. By contrast Saskatchewan's four largest held only 32 per cent of the 1970 business, Alberta's four largest held only 36 per cent of that province's business, and Quebec's five largest had only 36 per cent of that province's 1970 business. The same conditions do not obtain in Ontario or British Columbia where the 12 largest and 11 largest firms shared 42 per cent and 58 per cent of the 1970 business respectively. These values on share of business may yield an underestimation for the provinces because these largest firms may not really compete for all business, especially the small items of repair and maintenance, but the error should be small. If the standard concerns over concentration apply there is not much monopoly power to fear, with the possible exception of Manitoba. However, that condition, the applicability of the standard concerns in the construction industry, should not be unchallenged. Additionally, the use of bid procedures, job by job, and the shifts in demand created by the introduction

of major projects can allow for substantial shifts in the pattern. Only data for a series of years can be useful in the dynamic context of the construction industry. Unfortunately, we will have to wait several years until we have a series of censuses to analyze.

Several other attributes of the performers in this industry will be outlined for the year 1970 but regional differences will not be of substantial importance in this portion. Economies of scale are not being examined either here since that is being done by another study.[6] A series of qualitative indicators, by no means the most significant, are reviewed and set out as they are distinguished by size class.

Profit and Loss

First looked at is the profit and loss picture by firm size. Table 4.2 sets the calculated values out. The profit rate, as a percentage of sales, measures the average mark-up. It is only one of many indicators of economic performance, but because of serious problems with data suitability it is not possible to calculate a good return on capital. Gross margin's limitations have been discussed above.

The table shows that some firms in all size classes make losses, and some make profits. The smallest profitable firms appear to have the highest mark-up at 6.2 per cent. The rate starts to fall as the profitable firms get larger, with the medium size class ($750,000 to $1,000,000) having the lowest level, but then it rises again for the largest classes. Maybe this is a reflection of a common industry point that medium-sized firms are under the most severe financial strains. The profit side should be seen beside the loss side to expand the context. Losses, as percentage of sales, tend to be higher for the small firms and decrease with expanded size. This is quite consistant with what is being discussed elsewhere -- that small firms tend to have less competition and less

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[6] M. R. Prentis, compansion study in the series on the Economic Council's Reference on Construction Instability, forthcoming.

Table 4.2

PERCENTAGE PROFIT RATES ON SALES FOR THE

HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS.

ALL CANADA, 1970

	SIZE GROUP BY SALES ($000)									
	Total	0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over 5000
Profitable Firms	4.9	6.2	5.2	5.4	3.9	2.9	4.8	4.9	5.4	5.0
Loss Making Firms	1.3	5.3	3.7	2.0	1.8	1.0	1.7	1.0	0.9	1.1
Net Gain, All Firms	3.7	1.0	1.5	3.4	2.1	1.9	3.1	3.9	4.5	3.9

Source: The Highway, Road, Street and Bridge Contracting Industry, (Statistics Canada, Bulletin 64-206), 1970.

competent management, both of which contribute to a wider dispersion of the results, and that the large firms have more competition but better managers which narrows the dispersion of profit and loss results.

Another interpretation of this data suggests that there is more heterogeneity than the industry definition implies and that it is related to the size of the firm. This is more obvious in other sections of the construction industry (e.g., mechanical contractors), but it comes up here too and merits mention. A proposal, for subsequent analysis purposes, is to have a subdivision of the data based on the division between new construction and repair and maintenance construction.

Age Distribution

The age pattern of firms in an industry can be an indicator of stability and durability of the industrial structure. Such a distribution for the highway contractors in 1970 is interesting especially because it is available by size class. Table 4.3 presents this data which came in response to a census question.

The most prominent feature is the extensive difference in the age pattern between the large and small firms. One-third of the smallest size of firms have been in the highway construction business less than a decade and just over half of the firms are less than 15 years old. By contrast, just over half of the largest firms have been in the same business longer than a quarter century. One cannot be sure from this data that it is a question of progressive growth but that certainly is consistent with these figures. A change appears for firms at the sales level above $1.5 million. Below that level roughly half of the firms are less than 15 years old; above that sales level roughly half the firms are over 20 years old.

Table 4.3

AGE DISTRIBUTION OF THE HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS, ALL CANADA, 1970

Number of Years in this Business	Total	SIZE GROUP BY SALES ($000) 0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over to 5000
1 to 9	199	37	61	41	27	5	13	4	8	3
10 to 14	122	24	26	15	18	11	12	3	10	3
15 to 19	95	11	10	21	13	9	9	7	13	2
20 to 24	75	10	16	9	10	5	2	5	14	4
25 to 29	27	1	1	3	1	1	7	6	5	2
Over 30	74	3	8	8	4	6	7	8	14	16
Unspecified	92	26	18	18	13	1	8	1	3	4
Total	684	112	140	115	86	38	58	34	67	34

Source: Revised Table from The Highway, Road, Street and Bridge Contracting Industry, 1970, (Statistics Canada Bulletin 64-206).

Table 4.4

NUMBER OF SALARIED EMPLOYEES, HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS. ALL CANADA, 1970

	Total	SIZE GROUP BY SALES ($000) 0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over to 5000
Number of Salaried Employees per Firm	7.5	.7	1.6	3.0	4.6	5.7	7.2	12.3	17.5	55.4
Dollars of Sales per Person ($000)	194.8	86.9	123.4	148.2	159.5	191.8	208.0	181.0	228.0	203.9

Source: The Highway, Road, Street and Bridge Contracting Industry, 1970 (Statistics Canada, Bulletin 64-206).

The second feature that is observed refers to the implications for entry that can be drawn from the data. While only a few successes were observed, 9 per cent of the largest firms have achieved that size in less than 10 years. At the other end of the scale, only a few firms over 25 years of age are in the smallest size class. It cannot be identified from this data whether they are declining firms or enduring small firms. However, it does seem clear that entry to the upper size levels is possible within a period less than one decade.

Finally, the extensive heterogeneity of the industry group stands out prominently from this table. Firms of all vintages exist in all size groups, on a national basis. The reason for this is undoubtedly a combination of factors, among them specialized skills and a wide variety of product demand included in the industry's output. In all regions there are firms of various ages in all size classes. The smaller firms take on jobs like parking lot paving and road maintenance; the larger firms take on jobs like new highways and major bridges. The long-run expectation would be to have this pattern continue. This adds justification to the earlier proposal to subdivide the industry by activity as well as scale.

Salaried Employees

While a very uncertain indicator, the number of salaried employees per firm can be a partial indicator of the stability of the firm. Many of these jobs will be office, record keeping, planning and administrative posts of the kind that size and complexity justify. The story at both ends of the size distribution is illustrative. As Table 4.4 shows, only some of the smallest firms have even one salaried employee while the largest firms are well stocked with 55 such people on national average.

Efficiency in the use of such persons, as measured by the sales volume per person, is 2.3 times higher in the largest firms as in the smallest. These values are not very surprising but they are numerical valuations for the expectations. The companion study on management goes into this question in more detail.

Subcontracting

Subcontracting is the procedure of passing on specialized tasks in a large project, say traffic sign installations for a new highway, to specialized contractors. Table 4.5 sets out the 1970 pattern of sub-contracting activity by size category. (The peculiar data biases that can arise due to this practice are discussed in Appendix , but they are not considered significant here.) The percentage of total construction revenue taken by subcontracting costs is a partial indicator of the amount of specialization. The greater the role of subcontracting, the greater the degree of specialization, or lack of diversification, of the firm. Data show a generally increasing trend in this ratio with larger sizes. This is not surprising, partly because the larger firms are getting the larger jobs which will tend to have more ancilliary facilities of the type done by subcontractors.

Diversification

Firms in all sections of the industry tend to earn some revenue by acting as merchants for material to other contractors or buyers of the final product. Table 4.6 below shows that this group of highway contractors earn roughly 10 per cent of their income from such other sources. This activity is shown to be of a very small significance for the smallest group of firms, being only 3 per cent of revenue, but for all other sizes this other source of revenue ranges from 6 to 14 per cent. There is a

Table 4.5

THE ROLE OF SUBCONTRACTING COSTS IN CONSTRUCTION REVENUES OF THE HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS.
ALL CANADA, 1970

		SIZE GROUP BY SALES ($000)								
	Total	0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over to 5000
The Role of Subcontracting Costs to Construction Revenue	0.14	0.10	0.08	0.11	0.11	0.14	0.11	0.12	0.13	0.17

Source: The Highway, Road, Street and Bridge Contracting Industry, 1970 (Bulletin 64-206, Statistics Canada).

Table 4.6

THE ROLE OF CONSTRUCTION REVENUES TO THE HIGHWAY, ROAD, STREET AND BRIDGE CONTRACTORS.
ALL CANADA, 1970

		SIZE GROUP BY SALES ($000)								
	Total	0 to 100	100 to 250	250 to 500	500 to 750	750 to 1000	1000 to 1500	1500 to 2000	2000 to 5000	Over to 5000
Construction Revenue/Total Revenue (%)	90.1	97.1	92.9	90.5	93.1	92.6	90.1	87.4	86.0	92.5

Source: The Highway, Road, Street and Bridge Contracting Industry, 1970 (Statistics Canada Bulletin 64-206).

tendency for middle size firms, those with sales from $1.5 to $4.0 million to have the largest share of income from these ancilliary sources but the level does not hold for the largest group. At this point no particular reason is known for this pattern, nor is its significance known.

Conclusion

The main structural feature that evolves from wide dispersion of product sizes, a persistence of varying sizes of firm, exists here. The evidence also supports the phenomenon of some differences in vertical integration for this subsector but this is where this feature applies the least. Integration of the two main stages of production, roadbed preparation and accessory construction (bridges, sidewalks, etc.) is easier, but the coalition of both types of firms into one data set prohibits statistical verification of this point. Structural data about the operational competition, project by project, would be better than what is available but this evidence suggests that there are enough entrepreneurs to permit competitive forces to operate.

4.3 The Electrical Contracting Industry

The Electrical Contracting industry consists of that section of the industry which installs, repairs and maintains the electrical portion of construction projects. The electrical contractors, most of which are covered by the census, did $640 million worth of construction in 1970.

Data on these firms, like that on highway constructors and mechanical contractors is available from two main sources: the industry survey and the now two year old industry census.

1) Time Series Data

It is not possible to present any meaningful time series analysis based on the available industry survey data. All it does show is that the "large" firms, those with "sales" in excess of $1 million per year, are a sizeable number in absolute terms, for national figures. For example, there were at least 53 of them in 1965 and are at least 97 now.

It is probably helpful to note here just why a meaningful time series analysis cannot be done. The data was based on a sample of unknown proportion of the population of electrical contractors. Prior to 1967 the size was no more than about 10 per cent of the population and its changes in size were unrelated to any real changes in the actual population. And, in addition, the response rate changed. Expansion to full industry size then is impossible. In 1969 the contribution of the electrical contractors was between 5 and 10 per cent of the total value of construction in Canada. This means that the survey sample of years prior to 1967 represented less than 1 per cent of construction volume. A base of comparison using total construction volume would be most inappropriate as expenditures elsewhere are

not broken into categories that would be helpful. The data on volume reported by the respondents is of no significance of course. Between 1967 and the first "census" the sample base rose 8.5 times in total and 51 times for the smallest size category. Table 4.7 shows the comparisons.

The introduction of the census of the industry in 1969 has improved the coverage and the detail of information about the electrical contractors. But now we only have two years, a totally inadequate coverage for time trend analysis.

The conclusion from this is blunt. We cannot tell what has happened to the size distribution of firms, nor of course test any reasons for the changes even if we did know those changes.

Table 4.7

Electrical Contractor

"Sample" Comparisons,

1967, 1968, 1969

Size Group ($ '000)	1967		1968		1969	
	No.	%	No.	%	No.	%
0 - 100	36	10.7	121	17.1	1,837	64.3
100 - 500	149	44.4	383	54.1	804	28.1
500 - 1,000	87	25.8	118	16.6	123	4.4
1,000 - +	64	19.1	87	12.2	92	3.2
Total	336	100.0	709	100.0	2,856	100.0
Index of Total Sample Size	100		211		850	

Notes: 1) 1967 was a small sample continuing a pattern from 1959.

2) 1968 was an expanded sample done prior to introduction of a "census"

3) 1969 began the attempt at a full census.

Source: Industry survey and industry census data on the electrical contracting industry, The Electrical Contracting Industry, 1970, Ottawa, Statistics Canada, annual after 1969.

2) Cross-Section Data

What are the static features of the Electrical Contracting industry that can be of interest? Several elements are presented here. It is to be stressed that the changes occurring between 1969 and 1970 do not give any reason to support a trend and to draw such conclusions would be misleading. Because of the risk of erroneous judgements comparisons will be few.

Concentration of Business

On a national basis, in 1970, there were 97 firms in the largest size group, that is those with sales revenues over $1 million. These large firms had, on average, $2.86 million in revenues, a figure which is only .4 per cent of national sales. This same group represented 3.3 per cent of the 2,930 firms and shared 43.7 per cent of the total revenue. In standard terms of reference for concentration, this provides no reason to believe there is insufficient competition. This was essentially an unchanged relative position from 1969. Details are on Table 4.8.

Regional patterns are important for this industry too, and a glance at the data on this basis does not alter the earlier conclusions. Table 4.9 shows some differences, but in using the criterion of the share of sales to average firm in the largest size category one must conclude that the degree of concentration is minimal here. The biggest share of the particular market held by an average of the large firms is 6.6 per cent in Manitoba. In only one case, Ontario in 1970, do the largest firms as a group hold over 43 per cent of the business in the area. Of course, there may be reasons to justify an even finer breakdown of the geography, but at this point none appear. Electrical Contracting is just a very unconcentrated industry. What the implications of this are is left to later analysis.

Table 4.8

CONCENTRATION OF BUSINESS, ELECTRICAL CONTRACTORS,

ALL CANADA, 1970

		SALES SIZE ($000)						
	Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
Revenues - value ($000)	639,372	9,708	23,389	44,537	94.410	89,987	99,506	277,834
- distribution (%)	100.0	1.5	3.6	6.9	14.6	14.0	15.7	43.7
Firms - number	2,930	653	615	609	571	246	139	97
- distribution (%)	100.0	22.3	21.0	20.8	19.5	8.4	4.7	3.3

Source: The Electrical Contracting Industry, (Statistics Canada Bulletin 64-205), 1970.

Table 4.9

CONCENTRATION OF BUSINESS AMONG THE LARGEST ELECTRICAL CONTRACTORS ON A REGIONAL-PROVINCIAL BASIS, 1969 AND 1970

Area	1969			1970		
	No.of Large Firms	Share of Business	Share to Average Large Firms	No.of Large Firms	Share of Business	Share to Average Large Firms
British Columbia	13	40.4	3.1	10	35.4	3.5
Alberta	11	40.5	3.7	10	42.4	4.2
Saskatchewan	3	18.9	6.3	n.a.	n.a.	n.a.
*	6	30.2	5.0	5	30.0	6.0
Manitoba	5	32.9	6.6	n.a.	n.a.	n.a.
*	14	56.5	4.0	15	60.2	4.0
Ontario	34	40.9	1.2	39	51.2	1.3
Quebec	21	36.9	1.8	22	39.2	1.8
Atlantic	5	26.2	5.2	7	35.0	5.0
Canada	92	37.8	.4	97	43.7	.5

* In 1970 the two largest size classes were aggregated for secrecy purposes and these figures allow comparison between the two years. These data are for all firms with revenue over $500,000.

Source: The Electrical Contracting Industry, 1969 and 1970 editions, Statistics Canada Bulletin 64-205, annual after 1969.

Profitability

Here too, no return on capital analysis is possible in an economic sense but the average mark-up or return on sales, as it differs by size class, shows something about the Electrical Contractors. There is a definite and strong difference between the smallest size classes and the largest. The smallest firms mark-up is about 23 per cent, a sizeable amount compared to the industry average of about 5 per cent and that of the largest firms which is about 3.5 per cent. This pattern is consistent with the other sectors of the industry that have been examined. Homogeneity there is not. Table 4.10 presents the figures.

Role of Construction Activity

The role of construction revenue as a per cent of total is an indicator of specialization. There is a definite upward trend between the smallest firms, with only about 96 per cent of their revenue from construction, and the largest firms, with about 98.5 per cent of their revenue from construction. As with road contractors, there was a downward deviation from the trend in the middle size firms (sales from $100 to $250 thousand here). The significance of this is not clear. Table 4.11 shows the data.

Number of Salaried Employees

As the size of firm expands the expected pattern of number of salaried employees per firm shows up in the Electrical Contracting industry. Table 4.12 presents the numbers. There will likely be more stabilizing momentum to the larger firms with their sales and administrative staffs and possibly better efficiency. Unfortunately good checks on these aspects are not feasible from this data.

Table 4.10

RATE OF RETURN ON SALES, BY SIZE CLASS, ELECTRICAL CONTRACTORS,

ALL CANADA, 1969 AND 1970

		SALES SIZE ($000)						
	Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
					1969			
Profit/Revenue	5.4	22.8	16.1	9.5	6.2	4.3	2.9	3.9
Loss/Revenue	0.7	1.0	0.8	0.6	0.8	0.7	1.3	0.4
Net Gain/Revenue	4.7	21.8	15.2	8.8	5.4	3.5	1.6	3.5
					1970			
Profit/Revenue	4.8	23.0	16.8	9.6	5.8	4.5	3.1	2.6
Loss/Revenue	1.1	0.2	1.4	1.2	1.3	0.9	0.8	1.0
Net Gain/Revenue	3.7	21.2	15.4	8.3	4.5	3.6	2.3	1.6

Source: Calculations from the Electrical Contracting Industry, (Statistics Canada Bulletin 64-205) 1969 and 1970.

Table 4.11

ROLE OF CONSTRUCTION REVENUE IN TOTAL REVENUE, ELECTRICAL CONTRACTORS,

ALL CANADA, 1970

		BY SIZE GROUP						
	Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
Construction Revenue as Per Cent Total Revenues	98.1	95.6	97.1	97.6	96.9	97.8	98.9	98.6

Source: The Electrical Contracting Industry, (Statistics Canada Bulletin 64-205), 1970.

Table 4.12

NUMBER OF SALARIED EMPLOYEES PER FIRM, BY SIZE, ELECTRICAL CONTRACTING INDUSTRY,

ALL CANADA 1969 AND 1970

		SALES SIZE CLASS ($000)						
	Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
1969	15.5	0.02	0.11	0.59	1.72	3.33	5.67	16.15
1970	16.9	0.07	0.25	0.88	1.86	3.09	5.06	17.36

Source: The Electrical Contracting Industry, (Statistics Canada Bulletin 64-205), 1969 and 1970.

Miscellaneous Comparisons

Table 4.13 sets out several other values about the firms in this industry, particularly as they relate to the size of the firms.

Roughly half of the Electrical Contractors are unincorporated firms. But nearly 90 per cent of the smallest firms are unincorporated while none of the largest firms adopt this form of arranging their business. The trend away from the unincorporated form as size increases is dramatic.

Roughly half of the firms tend to specialize in work on small residential work. Well over half of the firms with less than $100,000 of sales specialize in this type of work. By contrast very few firms in the largest size class specialize in such work.

The small firms also tend to concentrate on the repair work also. Few large firms are concentrating on this activity.

The final set of data on Table 4.13 shows the specialization as "prime contractors" is concentrated among the small firms too. What this means is that more of these firms take on jobs for the ultimate buyer and not as part of a large project wherein they only do a portion of the job being supervised by another general contractor. Thus the extent of operating with this particular legal arrangement has some implications for the work done.

Finally, the data on the role of sub-contracting in total construction business is presented in Table 4.13. It rises with scale in a definite trend in both years for which data is available. This means, in part, that the jobs undertaken by the larger firms include tasks that go beyond their

Table 4.13

MISCELLANEOUS FEATURES OF THE ELECTRICAL CONTRACTING INDUSTRY BY SIZE CLASS, CANADA, 1969 AND 1970

			SIZE CLASSES ($000)						
		Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
Proportion Unincorporated Firms (%)	1969	48.2	89.1	71.7	47.6	18.3	2.8	0.8	-
	1970	51.2	89.6	74.3	52.1	21.5	6.9	0.7	-
Proportion Specializing in Small Residential Work (1-3 units) (%)	1969	47.0	72.5	64.4	50.4	28.5	12.7	8.1	2.2
	1970	49.6	74.3	65.9	57.1	27.1	19.5	7.9	2.1
Proportion Specializing in Repair (%)	1969	20.0	35.7	25.4	20.0	11.8	3.9	1.6	1.1
	1970	24.6	42.4	30.4	23.2	15.8	7.7	4.3	1.0
Proportion Specializing as Prime Contractors (%)	1969	61.5	86.2	75.7	65.0	47.4	31.1	19.5	7.6
	1970	61.9	87.7	76.3	64.4	47.3	29.3	20.1	10.3
Role of Sub-Contracting Costs in Construction Revenue (%)	1969	1.4	0.3	0.5	0.3	0.8	1.2	1.5	2.1
	1970	2.0	0.8	1.0	0.9	1.1	1.4	1.3	3.0

Source: The Electrical Contracting Industry, (Statistics Canada Bulletin 64-205) 1969 and 1970.

normal pattern of skills and that they call on other groups, even those within the same industrial group, to assist.

Conclusion

The significance of these figures is not so much that they show the industry moguls anything new but that we have some numerical measures of the industry. This group is clearly a separable subsector of the construction industry. The basis of distinction is the type of product, and the skills to a lesser extent, but it is not a final product in most cases. Electricals are really intermediate parts of a total project, as the data on "prime contractor" status indicates. Also these variables tend to shift with the firm's size. Both policy and data collection should take this into account in the future. The earlier stated proposal is repeated here because there is real, extensive and important heterogeneity even within what is now called the Electrical Contracting Industry. Thus the main structural themes are supported by this analysis and data.

4.4 The Mechanical Contracting Industry

Mechanical Contractors are those who install, repair and maintain plumbing, heating, piping, air conditioning, ventilation systems, automatic sprinklers and do other related work. Their output goes into residential, institutional, commercial and other kinds of construction. The group is identified by their output even though it too is only an intermediate product.

In 1970 the work of the contractors classed as Mechanical Contractors represented 10 per cent of that year's total construction expenditure of $13.8 billion. However, this is not necessarily the amount spent on the types of equipment installed because there is some double counting in the data and, more importantly, some important but unknown amount of this type of work is done by employees on the payroll of the buyer, the so-called "own account" work which is not recorded in the industry census data.

1) Time Series Data

The Industry Survey that was reported on with regards to previous types of contractors also collected data on the sub-sectors of the industry where the Mechanical Contractors fit. But, as in the case of the Electrical Contractors, this data is so inadequate for any real analysis that I believe that it would be misleading to present it lest someone fails to recognize the major deficiencies and unwisely draw erroneous conclusions. The cross section data now extends over four years from 1967 to 1970. However, this sub-sector of the industry was the first to be covered by a census and the reported change in industry size

between 1967 and 1969, from 2021 to 4002, up 92 per cent in two years, is really just an improvement in coverage of the census. This reduces the time span covered by 2 years, and, as we all know, two years is really insufficiently long to identify most trends let alone examine cyclical relationships. Therefore, the main intention of this study is again thwarted by data insufficiencies.

2) Cross Section Analysis

Due to the facts about the expansion of the "census" sample just noted it is best to restrict the cross-sectional study to the two latest years, 1969 and 1970.

Concentration

Table 4.14 shows that just over 200 firms are fit into the largest size class (over $1 million sales) and share just over 50 per cent of the business. The average large firm then, with sales of $3.4 million, holds just less than .25 per cent of the national market. This is an extremely low level of business concentration. However, this is not an adequate picture because this part of the industry is made up of several sub-sectors and there are regional markets to contend with.

First, there is the question of the sub-trades. National data is presented on Table 4.15. The category "Plumbing and Wet Heating" has 97 of the largest firms sharing 44.6 per cent of the 1970 market. But an average firm in the largest size group held only .4 per cent of the national market in 1970. "Dry Heating" has the 10 largest of 749 firms with only 14.6 per cent of the market. This means 1.4 per cent of this national market went to an average member of the largest class of firms.

Table 4.14

MECHANICAL CONTRACTORS. CONCENTRATION OF BUSINESS BY SIZE,

ALL CANADA, 1969 AND 1970

		SIZE CLASS ($000)					
	Total	0 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
				1969			
Firms -- number	4,002	1,514	793	841	393	253	208
-- distribution (%)	100.0	37.8	19.8	21.0	9.8	6.3	5.2
Sales -- value ($000)	1,254,076	40,265	60,523	147,548	154,786	204,373	646,579
-- distribution (%)	100.0	3.3	4.8	11.7	12.3	16.3	51.5
				1970			
Firms -- number	4,250	1,643	900	822	415	247	223
-- distribution (%)	100.0	38.6	21.2	19.3	9.7	5.8	5.3
Sales -- value ($000)	1,367,750	44,346	68,183	141,974	164,735	198,662	749,849
-- distribution (%)	100.0	3.1	4.9	10.4	12.2	14.5	54.8

Source: The Mechanical Contracting Industry, (Statistics Canada Bulletin 64-204) 1969 and 1970.

Table 4.15

DISTRIBUTION OF SALES AND FIRMS, BY SIZE AND MECHANICAL SUBTRADE, CANADA, 1970

		SALES SIZE ($000)						
	Total	0 to 25	25 to 50	50 to 100	100 to 250	250 to 500	500 to 1000	Over 1000
Plumbing and Wet Heating								
Firms -- number	2,907	598	624	630	548	266	144	97
-- distribution (%)	100.1	20.6	21.5	21.7	18.9	9.2	5.0	3.3
Sales -- value ($000)	715,162	8,801	23,668	47,338	95,115	104,821	118,359	317,062
-- distribution (%)	100.1	1.2	3.3	6.6	13.2	14.7	16.5	44.6
Dry Heating								
Firms -- number	749	166	149	187	155	56	26	10
-- distribution (%)	100.0	22.2	19.9	25.0	20.7	7.5	3.5	1.3
Sales -- value ($000)	103,953	2,600	6,240	14,433	25,126	20,324	20.422	14,808
-- distribution (%)	100.0	2.5	5.9	13.6	24.1	19.5	19.7	14.6
Process Piping								
Firms -- number	95	9	4	14	11	12	9	36
-- distribution (%)	100.0	9.5	4.2	14.7	11.6	12.6	9.5	37.9
Sales -- value ($000)	175,760	104	169	1,094	1,943	5,395	6,855	160,199
-- distribution (%)	100.0	0.1	0.1	0.6	1.1	3.1	3.9	91.1
Air Conditioning and Ventilation								
Firms -- number	301	34	43	66	58	46	54	
-- distribution (%)	100.0	11.3	14.3	21.9	19.3	15.3	17.9	
Sales -- value ($000)	257,054	1,271	3,416	12,250	23,886	36,783	179,449	
-- distribution (%)	100.0	0.5	1.3	4.8	9.3	14.4	70.0	
Automatic Sprinklers								
Firms -- number	37	5	3	3	8	9	9	
-- distribution (%)	100.0	13.5	8.1	8.1	21.6	24.3	24.3	
Sales -- value ($000)	31,924	105	198	420	2,921	6,022	21,457	
-- distribution (%)	100.0	0.3	0.6	1.3	9.3	21.2	67.3	
Miscellaneous Mechanicals								
Firms -- number	161	27	27	23	39	15	13	17
-- distribution (%)	100.0	16.8	16.8	14.3	24.2	9.3	8.1	10.6
Sales -- value ($000)	83,897	367	1,021	1,704	7,120	7,388	9,421	56,876
-- distribution	100.0	0.4	1.2	2.1	8.4	8.3	11.5	68.1

Source: The Mechanical Contracting Industry, Statistics Canada Bulletin 64-204, 1970.

Some differences appear in the "Process Piping" sector where the number of specializing firms drops to only 97 for the whole country. Of these 38 per cent are in the largest size class sharing 91 per cent of the business. But, because this group includes 36 firms it means an average firm in this group still holds only 2.5 per cent of the 1970 national market. Automatic Sprinkler contractors also have a small number of actual firms, at 37 for the country. Half of these have sales in excess of $500,000 and share almost 90 per cent of the business volume. Yet even here, the average largest firm still only holds 7.5 per cent of the national market. If the other conditions favouring competition hold, a point yet to be discussed, there is not enough concentration to cause real concern in the sub-trades either. Unfortunately we cannot tell if there are undetected trends that may make this conclusion too lenient.

There is some reason to believe that regional markets are of some significance. This is more important for the smaller size of firm. A comparison of the regional distribution of firms by number and the distribution of business volume in mechanical construction shows that the two are nearly equal. That is, the number of firms per dollar of business is close in all five Canadian regions. Where the possible concerns for competition could come from are special local situations, especially for smaller jobs. Data on profit rates per sales dollar tend to support this view. Evaluations of individual geographic areas would really require many specific examinations and a total cataloguing of all regions is not made here.

Miscellaneous Performance Results

Several other comparisons, like those presented earlier, can be made to round out this discussion.

First, consider the role of the unincorporated firms. As elsewhere they predominate in the small size classes where about 90 per cent were smaller than $100,000 in 1970. None of this type of legal entity operated with sales over $1 million. About 87 per cent of these firms concentrate on residential work with 96 per cent of this residential work being concentrated on small residences (1 to 3 units). The allocation of unincorporated firms by specialty also shows that 38 per cent of them concentrate on new construction, 14 per cent on renovation and 48 per cent concentrate on repair and maintenance. The amount of sub-contracting done by the unincorporated sector represents just under 2 per cent of construction revenues. By contrast, the incorporated sector has about 12 per cent of its work value sub-contracted. These figures are a result of size and specialization differences. Another difference that comes out is the ratio of skilled workers to unskilled. Incorporated firms tend to average 72 per cent of their workers in the skilled category while unincorporated firms have, on average, only 60 per cent of their workers in the skilled class.

Several other comparisons by size class are also interesting. Tabular data is not presented because the pattern is quite similar to that presented for other sectors of the industry. In the smallest size class 56 per cent concentrate on repair while only 2 per cent do this in the largest size class,

where new construction dominates at 97 per cent of the firms. The smallest firms are heavily concentrated on small residential units, at 84 per cent, while only 5 per cent of the largest firms are in that as a specialty. The largest firms employ 3.5 times as many journeymen as apprentices while the rates for the smallest firms is 2.3. What this may mean in terms of the relative quality of the work is hard to evaluate. Smaller firms tend to have a larger mark-up in this sector also, with 21 per cent on sales for the smallest profitable firms. The comparable figure for the largest firms is 2.5 per cent. Losses are 2.5 per cent of sales to the smallest firms and only 0.8 per cent for the largest firms.

Conclusion

It is clear then that the general pattern for the Mechanical Contractors is consistent with that for the other sectors of the construction industry that have been examined. The earlier conclusions about the large degree of heterogeneity being significant and that this is related to the scale of operations are applicable here too. Data collection and policy proposals will have to retain these distinctions. These findings uphold the main theme well. The subdivision of this group into even small subsidiary groups is most illustrative of the heterogeneity whatever classification criteria are adopted.

4.5 The Small Construction Business

The small business is usually organized as a proprietorship or a partnership for several reasons such as the cost of incorporating, the greater legal requirements for a corporation, a lack of sophistication in management, and so on. Once the scale of operations rises, however, the corporate form is usually adopted because it is more advantageous to do so for tax and other reasons.

The Role of Small Business

While this sector of the industry typically shares only a small portion of the total business in any trade group, it still represents a significant number of business units. A current 1972 estimate has approximately 60,000 firms in the "proprietor" category out of an estimated total of 80,000 firms, that is 75 per cent of the number of firms. In 1969, National Revenue data showed that Construction Proprietors were the second largest category of Business Proprietors, and represented about 16 per cent of all Business Proprietors. The income they claimed on tax returns held the same standing. Within the Mechanical Contracting group, in 1970, 1,945 firms, about 46 per cent of the firms, were proprietorships and partnerships. The 1970 data on Electrical Contractors shows 1,500 firms, or 52 per cent of the census were proprietorships or partnerships.

In 1969 unincorporated firms were estimated to have only 12 per cent of the value of business in the Electrical Contracting industry and 7.5 per cent of the business in the Mechanical Contracting sector. No unincorporated Mechanical Contractors had sales over $1 million in 1969 and 90 per cent

of these firms had gross sales less than $100,000. Of the 1,500 unincorporated Electrical Contractors surveyed by Statistics Canada for the year 1970 about 91 per cent had sales less than $100,000.

Therefore, while the share of total business is not large the presence of such a sizeable number of small businesses justifies some consideration in a study of the industry.

Data Availability

Data is available about this group of firms from two sources, taxation statistics and the Statistics Canada survey censuses. Unfortunately the two are not reconcilable. Taxation data is based on tax filings. Proprietors and partnerships are responsible for tax as individuals, but because they are in business the usual business expenses are deductable. Only the net business income is made public so we have to rely on this figure which is in fact the profits of the business prior to any allowance for a labour income to the owner himself. Actual tax payments are also available, but since these are based on the graduated personal scale and adjusted for personal allowances and deductions they do not permit particularly useful calculations for this study. The analysis is inevitably limited in this situation. The other sources of data are the industry census and reports by Statistics Canada. This source varies in quality because of the new and partial status of the industry census as of this point in time. In spite of these circumstances some discussion is called for because certain policy instruments designed to affect construction firms may be biased as they affect the unincorporated sector.

Table 4.16

TIME TREND ON NUMBERS OF CONSTRUCTION FIRMS

Year	Number of Firms			Percentages		
	Unincorp.	Corp'n.	Total	Unincorp.	Corp'n.	Total
1956	42,050	6,624	48,674	86	14	100
1957	40,597	7,659	48,256	83	17	100
1958	41,299	8,817	50,116	82	18	100
1959	43,095	10,342	53,437	81	19	100
1960	45,387	11,381	56,768	80	20	100
1961	46,379	11,938	58,317	80	20	100
1962	45,161	12,820	57,981	78	22	100
1963	44,385	12,898	57,283	77	23	100
1964	44,041	13,959	58,000	76	24	100
1965	46,443	15,315	61,758	75	25	100
1966	50,688	14,846	65,534	77	23	100
1967	51,824	16,183	68,007	76	24	100
1968	55,407	17,694	73,101	76	24	100
1969	58,188	19,202	77,390	75	25	100

Sources: Department of National Revenue Taxation Statistics for the various years.

Characteristics of Unincorporated Sector

Data on certain other characteristics of the unincorporated sector are available. They show that the sector concentrates on the repair or maintenance activities of the industry.

In the 1970 census of Electrical Contractors it was found that 40 per cent of the firms specializing in new construction were unincorporated, but 65 per cent of the firms specializing in renovation and repair and maintenance were unincorporated. Unincorporated firms represented 65 per cent of the prime contractors, 26 per cent of the prime sub-contractors and only 36 per cent of the sub-contractors. Comparing the unincorporated firms to the incorporated ones shows that the former have: only 6 per cent as many salaried employees per firm, only 12 per cent the sales per firm (with $48,450), a bad debt rate on the sales dollar that is 1.6 times higher, and a profit rate on sales for profitable firms that, at 14 per cent, is four times that of the corporate sector. It seems reasonable to recognize these firms as a distinct sub-group.

The 1970 census of Mechanical Contractors shows a similar pattern. Only 31 per cent of the firms which concentrate on new construction are unincorporated while, 57 per cent of those who concentrate on renovation and 65 per cent of those firms which concentrate on repair and maintenance and proprietors or partnerships. Compared to incorporated firms the unincorporated group have: an average sales per firm only 8 per cent that of the incorporated sector, only 6 per cent the number of salaried employees per firm, and a profit on sales rate, for profitable firms of 13 per cent as compared with 3 per cent for incorporated firms. Here too then we have a substantially different kind of firm emphasizing a pattern of work which is different and which has sizeably different economic implications.

Small Business Earnings

The evaluation of profitability for small businesses is sometimes hard to make. One reason is that the motivation for proprietors is often influenced by non-monetary factors such as the desire to be more financially independent. Another is the difficulty of getting adequate data on all the resources actually being used in the business such as the entrepreneur's own time and the valuation of all capital being used. These problems have not been solved here, but are acknowledged as being unknowns for this analysis. In spite of these problems something can be said about the situation.

The concept of "opportunity cost" is adopted, that is the rate of earnings in the next best alternative employment. For construction proprietors this can be roughly estimated with the annual earnings (not hourly wage rates) of someone working in the same trade as an employee for someone else. Data on this latter figure are very limited. In particular, only 1968 figures are available and they show that, on average, construction workers earned $5,760 in that year. This is an average of course and does not adjust for interregional differences, skill level, etc. Using this figure as a base, it is quite acceptable to say that an average proprietor who earned less than this figure was in fact taking a monetary loss on his business. Although he may be prepared to pay this price for the independence, he should do it knowingly. The earnings above this level can be considered as those due to his function as an owner of capital and entrepreneurial organizer. This is somewhat arbitrary because the decision about which resource, labour or capital, merits first claim on the earnings raises certain value judgments. However, since the proprietor as a person fills both economic functions, the issue is rather academic. The practical decision is to evaluate whether the proprietor could earn more by selling his capital and earning financial returns from some security purchase plus being an employee for someone else. This cannot be

completely judged here, even on average, because data on the capital employed by these proprietors is not available, but some figures can be put forward.

Table 4.16 lists annual earnings data for several occupations in 1968 and several categories of construction proprietors. It is seen that the construction proprietor's earnings from his business depends on his specific activity. The "Other" category includes only 87 persons and the "Trades" group has about 83 per cent of the numbers of proprietors. Building contractors do best, at $5,425, but this figure is still less than the "average worker" earns by about 6 per cent. The "Trades" group is almost 25 per cent lower. On average, the situation is that contractors who operate as private proprietors earned 20 per cent less than an average employee in the construction industry.

The typical proprietor supplements his business income by almost 11 per cent with wages and salaries earned elsewhere and by almost 5 per cent with other income. But the total still rested about 8 per cent below the average construction employee in 1968.

The distribution of this income within the group is also known. The top 23 per cent of these proprietors earned 45 per cent of the income; the bottom 50 per cent earned 25 per cent of the income. Approximately 50 per cent of the proprietors earned less than the average income. 279 construction proprietors earned over $25,000, with the actual average for this group being $35,655. Adopting an entirely arbitrary $7,000 as an estimate of a break-even earnings level (the opportunity wage plus $1,240 for return on capital and entrepreneurial efforts) approximately 30 per cent of the unincorporated construction firms made a financial success in 1968. This still means about 39,000 firms were "unprofitable", a number that is not trivial.

Table 4.16

Earnings of Selected Employee Groups Compared to Earnings of Several Construction Proprietor, Types, 1968, All Canada

Employee Group	Annual Earnings
Carpenter	$ 5,230
Plumber	6,785
Electricals	6,525
Painters, etc.	4,285
Bricklayers	5,610
Plasterers	5,575
Hoist Operators	7,325
Labourers	4,080
All Group Total[1]	5,760
Employees of Business	5,680
All Employees	5,665

Proprietor Group	Annual Income All Sources	Annual Net Business Income
Building, Residential Proprietors	6,400	5,425
Highway, Street, Bridge Proprietors	5,520	4,985
Plumbing, Electrical, etc. Trades	5,100	4,415
Other Construction Proprietors	7,480	6,795
All Construction Proprietors	5,310	4,585
All Business Proprietors	5,165	4,090

[1] This is an unweighted average for seventeen categories, not all of which are listed.

Source: Taxation Statistics, Annual Report and special Unemployment Insurance Commission tabulation made for the Economic Council of Canada.

Caveats

Before suggesting the implications of these findings some caveats are in order. First, the data is for only one year. Secondly, the data is from a section of the business community where the incidence of unreported income is usually higher than elsewhere and this proprietor income data may well be too low. Thirdly, the proprietor and the wage earner may be doing similar work tasks but the proprietor has the advantage of tax deductions due to his business status which raise his real income. Fourthly, many of these proprietors may be located in geographic areas where the costs of living are lower. Fifthly, there is no adjustment here for hours of work, although one might expect these to be longer for proprietors because they have selling and administration activities to carry out in addition to the actual job tasks. And finally, the averages surely hide some quite successful businesses in this sector.

Conclusions

The fact that so many business proprietors are not earning as much as employed construction workers means that they are, on average, not very profitable. In fact, most are really business failures in the sense that they earn less than their next best opportunity. This is not the place to examine the specific causes of the situation, but there is no real reason to believe that this industry is faced with problems that are all that different from other small business.[7/] These

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[7/] This "small businesss problem" is noted in interesting detail in the Hearings Before the Select Committee on Small Business, United States Senate, Eighty-Seventh Congress, Second Session, June 25, 26 and 27, 1962, Washington: U. S. Government Printing Office, 1962. See the chart on pp 8-9 and elsewhere.

relate to the inability to co-ordinate the several functions necessary to operate the business, that is to manage. This real basic problem is not caused by cyclical features, although cyclical downturns can aggravate them and make their effects show up sooner. Growth, by contrast, can hide them, for a while. Much of the irregularity in the membership of the industry probably arises in this sector and it must be considered when the entry-exist patterns are evaluated.

This group it must be recalled represents all branches of construction activity. They are the aim of several calls for entry control into the industry. They are the symptom of what some call "fragmentation" and deemed, by some, to be undesirable. Is this true? Is it a source of real problems? If so, which ones? If so, can policies to exclude them be desirable?

Small firms exist in this industry because there are many small jobs to perform and because there is easy entry. The failure rate of small business is high, including small construction firms. This high risk leaves some problems, for sure. Sometimes workers do not get paid their wages, or suppliers their debts. Sometimes the work is done incompetently. Our current laws provide Mechanics' Liens to give special debt preference to workers and suppliers. The principle of caveat emptor is not to be ignored in the case of quality of work, and some recourse to it must surely apply. Fraud is part of the law where this may apply. But in spite of this real hardship results in some cases, as we know from what we hear but have been unable to quantify.

With this in mind, is the answer controlled entry? Do the same principles that have justified controls on entry

to socially vital areas where failure has high cost (e.g. medicine) apply here to construction? In part there is such cause so we ensure that electricians whose error could cause fires and death have adequate skills. But, control of entry is also mixed up with cartelization and price increasing supply restriction. If construction costs are a valid area of social interest we should not promote policies that will raise prices unless good cause exists. The recent Quebec experiment on control of entry to the labour force has not been a tremendous success. What I would propose here is that restricted entry to the construction industry not be used to solve other problems. They should be solved more directly. The construction industry should be left open for easy entry. Yes thatmeans many will earn less than their "opportunity wage", but they know the odds when they start, or should be able to tell quickly. The aggregate real harm is not much when contrasted with the fact that construction is a place where free enterprise capitalism, properly constrained to minimize the social costs, can operate. My suggestion is, to use the popular phrase,"Let it be!".

4.6 Changes of Firm "Size"

One feature of this industry which is peculiar to its structure is the ability of a firm to alter its scale both substantially and quickly. The measurement of size and capacity in construction is fraught with difficulties. With the ability to sub-contract any firm can take on a large number of jobs and then sub-contract portions of it. This is mostly true of the general contractors but applies elsewhere to a lesser degree. Sales are a measure of total volume for which a firm is responsible but not often a measure of what work it does itself.

Given the ability to take on a new project by hiring available resources in the sub-contracting system the resources on hand seldom measure the effective capacity of a firm. In such a situation then one could reasonably expect a more volatile situation of the size structure of this industry than elsewhere. That is,firms will be able to and will be observed to change size. Changes can be in either direction also. I am not referring here to the near truism that some firms must grow, or decline, when the industry grows or declines respectively, but to a state of affairs where change of size is a regular and recurrent component of industrial structure. Fortunately some data exist to measure this pattern of shifting sizes. It is not perfect, but it is indicative that the expected pattern does indeed exist, that it is a regular feature of the industry, and that it can be substantial.

Data

The data available is based on the Industry Sample collected by Statistics Canada over the years prior to the introduction of the Industry Census. It consists of matrices, based on the whole sample, in which firms are cross classified by "size this year" and "size last year". If there were no changes then the pattern in the tables would be a diagonal matrix with zero values off the diagonal. Growth would show up with positive numbers to the right of the diagonal; decline would show up with positive values to the left of the diagonal. What in fact we observe is a scattering of values on both sides of the diagonal, and indication of internal flux in both directions.

Serious Data Problems

The available data is not as useful as one would hope for testing hypotheses about cyclical trends. The sample is of an uncertain degree of representation and changes for reasons not necessarily related to the population of construction firms. The proportion of each sub-sector sampled is known to be different and, as other information has shown, it is only in the context of these sub-sectors that any real analysis has much validity. The data is based on an aggregation and since we know that sectors are out of phase with each other in their cyclical trends all values for the percentages of firms that change size will be low to an unknown degree. Also, firms are indicated as growing only if they change size class, and that can mask important growth rates. However, we can still verify the expected patterns of internal shift in both directions and make some proportional comparisons. In time, based on the new census, accurate measures of such shifts can be provided and suitable tests applied to examine hypotheses about the shifts and cyclical changes. With a view to promoting this, the data from the past sample is discussed so that the possible directions of its usefulness can be indicated.

Results

Table 4.17 set out below, shows the average pattern over the years 1953 to 1968, for the percentage of firms, by size class, which stayed in the same size class from year to year, which grew year to year and which declined year to year.

It is evident that the larger the firm size the less likely it was to stay in its size class, that is the more likely it was to shift. The value shown for the second largest group rises from the trend but this is due to the fact that the range of that size class was double that of the others. The figure for the largest firms was 82 per cent, a level which is accounted for by the fact that it is an open ended class. But still, about 17 per cent of the large firms left this group for a smaller size class. The smallest firms also exhibited a high tendency to stay in their original size class but here too there was growth, on the average, for 27 per cent of these firms. For the firms in the intermediate size classes the point that stands out is the near equal pattern of both growth and decline. This means that, over time, the probability of change is the same in either direction for all size classes. We do not know if this applies in the firms larger than those classified, and those firms are the ones we now know do the largest share of the business, but we expect it is observed there too.

Table 4.17

Change of Size Patterns,
All Construction Firms,
All Canada, 1953 to 1969 Averages

Size Class ($000)	Per Cent Staying Same Size	Per Cent Growing	Per Cent Declining
0 - 100	69	27	n.a.
100 - 200	55	25	18
200 - 300	39	31	28
300 - 400	29	37	32
400 - 500	23	38	38
500 - 600	20	40	38
600 - 700	17	42	38
700 - 800	14	43	41
800 - 1,000	24	38	36
1,000 - plus	82	n.a.	16

Note: "n.a." means not applicable. Firms in the smallest size class do not get smaller; firms in the largest size class do not get larger. The small size of the upper size class is to be noted for its inadequacy.

Source: Statistics Canada special tabulation of Industry Census data.

Most of the moves from one size class to another tended to be to adjacent size classes but it was certainly not unknown for firms to shift four or five size classes, in both directions, that is to change in sales by $400,000 or more from year to year. In terms of "capacity" this means an expansion or contraction at a rate not experienced in many industries, and probably unknown elsewhere as a frequent and annual pattern over the long run. This dimension of instability is a basic structural feature of the construction industry. All sample years exhibited data off the diagonal, that is some firms had sales changes enough to cause them to fit into a new size class.

Caveat, Conclusion

Again the caveat is made however, This data format is what is useful. It is a seriously restricted sample, the size categories are deficient at the upper end, and year-to-year changes cannot be analyzed to examine cyclical influences. Such analysis, in the industry censuses, could be very helpful in the future, especially for construction.

4.7 Entry Barriers

There are three main sources of entry barriers according to the standard theory developed by Bain.[8/] These are classified as barriers arising from absolute cost advantages, advantages due to economies to scale, and advantages due to product differentiation. Because the construction industry is so extensively heterogeneous it is not very meaningful to estimate

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8/ J. S. Bain, Barriers to New Competition, Cambridge, Mass.: Harvard University Press, 1956.

industry-wide barriers. The results depend critically on which subindustry is involved and which scale of output. Each source will be discussed here. By the way, Bain examined only manufacturing industries so has no particular comments on construction. The concepts still are relevant however.

Absolute Barriers

First to be reviewed are those things which Bain called "absolute" barriers, the kind which give existing firms with their stock of assets, resources, skills, etc., an advantage because it is costly for others seeking to compete to get these.[9/] Specific barriers can exist in construction, but they are generally regarded as very few because specialized resources that may give them rise are generally transferable under the contract system. Also, the causes which exist in other industries, e.g. patents, control of vital resources, etc., do not obtain for construction. Of course for some very special project categories there may be very special engineering skills, but this is rare. Usually the requisite skills are in abundant supply.

However, one source does exist in what we may class as a "political" barrier. Many buyers, especially governments, or other organizations that purchase a lot of construction, use a "prequalification" system whereby potential bidders must be approved for permission to submit tenders. The details for qualifying may not be public, but usually are. "Unqualified" firms are barred from entry to the competition. Where there are significant numbers of "qualified" firms this is not an

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[9/] Bain, op. cit., pp. 144-166.

unacceptable barrier in general, and of course the buyer creates it so must be prepared to bear the consequences in terms of price.

Housebuilding is a special case. Here "new" land is a basic requirement. In many markets most of this resource is owned by "land speculators" or "developers" as they are called. By this vertical integration to the primary resource such firms can effectively blockade entry if they so desire. For urban, and suburban areas where sprawling is the typical housing pattern, control of open land by firms can act as a very high absolute barrier to entry at efficient scale. Of course custom built houses are possible, even in such developments, after they are opened, but this is a rare pattern. Usually the developer has the housing built by his own construction subsidiary or by contractors to him. This is not usually true for urban renewal or apartments in areas where they replace existing housing stock because extensive control of sites is too expensive for all alternatives to be controlled.

Producer Differentiation

Usually it is called "product differentiation" but with a near-service industry the term "producer differentiation" avoids confusion with the obvious heterogeneities of the final product.[10/] Those qualities which give a buyer preference over one firm instead of another are the source of the differentiation. When the buyer has such preferences he is willing to pay some extra to be served by the one supplier instead of the other. The use of "invited tenders" shows this barrier does exist.

[10/] See Bain, op. cit., pp. 114-143.

Even with "open tenders" the final selection may reflect non-price factors like the firm's reputation or ability to be bonded. These too are at the buyer's conscious option. It is generally considered that this barrier is low, which means it is not a preventative factor for new firms seeking to enter.

Economies of Scale

This barrier, here meaning economies to mass production which yield a large volume producer advantages not available to low volume new entrants, is a difficult one to generalize about.[11] What is is not referring to is economies of the type that make high rise housing cheaper than equal size single family dwellings. One seldom has the chance to observe these economies of mass production in the construction industry because demand comes in single quantities for most projects, except single family housing.[12] In this way then we do not expect that economies of mass production generally create barriers to entry. However, for housebuilding they can give up to 11 per cent advantage to the firm building 300 units per year over those building only 50. Diseconomies are considered to accrue after about 1,000 units per annum.[13]

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[11] Bain, op. cit., pp. 53-113; C. Pratten and R. M. Dean, The Economies of Large-Scale Production in British Industry, An Introductory Study, Cambridge: Cambridge University Press, 1965; an J. Johnston, Statistical Cost Analysis, New York: McGraw-Hill, 1960.

[12] This position is upheld by P. J. Cassimatis, Economics of the Construction Industry, The Conference Board, Studies in Business Economics, No. 111, New York, 1969, pp. 30-31 and 55-68; and by J. P. Herzog, "Structural Change in the Housebuilding Industry", Land Economics, May 1963, pp. 133-142.

[13] Herzog, op. cit., pp. 137-138; and Cassimatis, op. cit., pp. 63-68.

But here too, with this size of minimum optimal scale most metropolitan urban markets would support eight or nine optimum scale firms while many smaller markets do not support such efficient firms. For example, in 1971 Montreal had 5,200 single family detached dwelling starts while Saskatoon had only 500.[14/]

Combined Effects

The sum of these barriers each being small, is likewise small. Entry is easy into the industry for most cases, the only exception being housebuilding where land holdings and economies of scale provide high barriers. Even this is only the suburban sprawling kind of housebuilding, however, because redevelopment sites are not controlled in this manner.[15/] The implications of this are discussed elsewhere in this report.

4.8 Foreign Ownership

Foreign ownership has not been a major issue in the construction industry. There are a few firms which are international in scope and are very specialized, e.g. some pipeline firms. But, given the local nature of the market and easy entry, one would expect that only a small percentage of firms would be foreign in this industry. It is certainly not an example of the extensive public concern as we see for our natural resource or manufacturing industries, but, as later data show, it is an area where some specific attention might be paid in the near future.

14/ Canadian Housing Statistics, 1971, Ottawa: Central Mortgage and Housing Corporation, 1972, p. 14.

15/ See companion study by J. H. Chung on housing for more specific analysis, Economic Council of Canada, Reference on Construction Instability, forthcoming.

Entry by foreign firms that seek to come to Canada is easy. Mergers are not really necessary unless the acquiring firm wants to get access to profits from projects underway. The Economic Council study by Reuber and Roseman[16] shows this fact quite well. Assets acquired by foreigners in the period 1945 to 1961 represented only 5 per cent of the industry's foreign controlled assets in 1962, which means the growth by merger was negligible.[17] About 1 per cent of all foreign-acquired firms were in the construction industry in the period noted when the industry represents about 5 per cent of all domestic (corporate) firms.[18]

The Grey Report tells us that, in 1968, only 14.5 per cent of the industry's assets, 13.3 per cent of its sales, 13.4 per cent of its profits, and 17.9 per cent of its taxable income are owned by firms with nonresident majority control.[19] For unknown reasons the 1965-68 figure for taxable income has major regional differences and they show an increasing trend as one moves west. The all-Canada value is 20.6 per cent.

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[16] G. L. Reuber and F. Roseman, The Take-Over of Canadian Firms, 1945-61: An Empirical Analysis, Ottawa: Economic Council of Canada Special Study No. 11, 1969.

[17] Reuber, Roseman, op. cit., pp. 7, 41.

[18] Ibid., pp. 20, 21, 56.

[19] Foreign Direct Investment in Canada, Ottawa: Information Canada, 1972, pp. 22 (the Grey Report).

While it is only 10.2 per cent in the Atlantic Provinces it is 42.6 per cent in British Columbia.[20] The pattern, as one moves West, is upheld by reference to a regional allocation of income by these foreign firms.[21] The reasons for this regional pattern would be interesting, if known. It may reflect the pattern of projects and the specialized firms.[22] Unfortunately more is not known about this. Any further study would find it a topic of potential interest.

4.9 Exit and Bankruptcy

One of the assertions often made in relation to construction is that it is a risky business and that bankruptcies are an outcome of this, especially in terms of cyclical variation. With this orientation the subject of exit via bankruptcy is examined. The main findings are that some exit via bankruptcy occurs, that there is some cyclical impact on top of a base rate of bankruptcy, that construction bankruptcies are more volatile than manufacturing failures but at nearly equal rates, and that the real economic impact of bankruptcy on society is not significant.

Forms of Exit

The exit of a firm from an industry can come about in more than one way. The exit can be complete by the total withdrawal of both the plant and the firm from production activity. Or, the exit can be by the withdrawal

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[20] Grey Report, op. cit., p. 23.

[21] Ibid., p. 24.

[22] Or, it may reflect regional profitability. At this point I can only suggest directions to look.

of the firm while plant and facilities are merged with those of another firm. Partial exit can occur when part of the inputs are closed down or transferred. And, some apparent exits are really only reorganizations of the firms. The degree of impact on competition could be different in each case.

The exit can come about as the result of a quiet voluntary withdrawl or as the result of a forced exit via bankruptcy. Examples of the former type are retirement of an entrepreneur, sale to a buyer offering a good price, or negotiated arrangement with creditors as a stop loss procedure when things turn bad for the business. The exit via bankruptcy comes when losses cumulate to the point where regular bills cannot be paid and creditors force it. Bankruptcy conditions usually require some time to develop so a lag will exist between the arrival of conditions leading to bankruptcy and its recognition by the owners and the creditors. Sometimes the lag is extended due to criminal acts of fraud.

Use of Bankruptcy Data

The use of data on bankruptcies is like using mortality rates as an indicator of general health. Since only the terminal cases are noted, after the event, the picture shown is very incomplete and of inadequate use for good policy prescriptions. However, it does play a role in the full context and merits examination.

Comprehensive data on total exit from the contract construction industry in Canada is not available. Only an estimate of the current number of firms and the number of bankruptcy exits, and the amount of outstanding liabilities of the bankrupt at the time of the filing. This value figure is a gross amount which may not represent the final net loss to creditors and which will be biased upwards by the very existence of the insolvency situation.

One often considers that bankruptcy represents failure in a most thorough and disastrous manner. The particular individuals involved must surely suffer ignominy as their firms or businesses fold and their dreams are shattered. However, as an economist, one must also ask if there is any other impact besides this loss. Does bankruptcy matter to the rest of us? The answer must be dependent upon the circumstances. In cases where it genuinely means a real loss of some kind of product, or where it causes other firms to go bankrupt in a domino pattern then failure can be crucial, say for a region. However, such results on the rest of the economy do not always result. Rather the loss of output from one source can be quickly made up by other producers, and in such cases the only real effect is an involuntary redistribution of wealth. This latter situation is basically that which exists for most construction failures. The buyer still wants his project even if the firm building it fails and he will just get

a replacement supplier as soon as possible. Bankruptcy trustees, and the surety bond industry where it is involved assist the process of replacement in the normal course of their operations. As a result then bankruptcy of a construction firm produces a delay while a replacement contractor is found, but it does not mean the loss of real capital to the economy nor the failure to complete the projects. In this context we must take a less serious interpretation of bankruptcy as a problem of concern to the economy. Let us now take a further look at the information available.

Cause of Exit

The time lags between the onset of conditions which finally lead to failure, the recognition of that state of affairs, and the termination of the business operations will depend on several features of the economy, and to some degree the specific industry situation. For example, basic economic theory suggests that the rate of change in demand, the variable to fixed cost ratios, the industry capital utilization, etc., can be considered as conditions that alter exit rates and lags. Faster rates of decline in demand should accelerate exit. A higher ratio of fixed to variable costs will reduce the exit lag after a decline in demand. And, an industry with lots of excess capacity should be hit more promptly

than one with full capital utilization after demand has shifted downward.

Studies on the topic of exit are few, but they tend to indicate that several interrelated factors increase the probability of exit. The age of the firm is inversely related to exit rates, that is, newer or infant firms have a higher mortality rate. Another feature found with most commercial failures is the small size of the firm, in an absolute sense. The smallest firms face the highest probability of failure. Within this particular group, studies have found a series of conditions that favour failure. Usually they boil down to one or more dimensions of poor management judgment such as the failure to promote sales, to collect receivables properly, to meet competition effectively on price or quality, etc. Also, wherever one person, as an individual, plays a major role the risk of failure rises appreciably, as compared to cases where a management team operates. Lower education levels and a lack of entrepreneurial (not occupational) skills and experience also exist in the sector of business where failure rates are high. Firms with high debt/equity ratios have a lower probability of extended survival in business. The service industries, including retailing and contract construction, exhibit this syndrome of symptoms

and, not surprisingly have high exit rates.[23/]

Findings also indicate that general business conditions, that is the trade cycle, have some impact on business failure. A downturn means a decline in demand and this will be distributed to some firms in such a way as to force failure upon them. However, business is not immunized against failure just because of growth, even the growth of the firm. Booms and high expectations can induce failure-prone entrepreneurs to give the business a try. Then, through recklessness and the usual bad management practices, they fail in spite of sales growth. In contract construction where the ability to prepare tenders profitably is vital, the lack of this one skill alone can prove fatal. Easy entry conditions permit this pattern of results and relatively rapid failure. This pattern has been well described in the following passage, which while written in a study about New Zealand is often

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[23/] References located confirming this set of causal elements for failure, including bankruptcy, were: Hearings Before the Select Committee on Small Business, United States Senate, Eighty-Seventh Congress, Second Session, June 25, 26 and 27, 1962, Washington, U.S. Government Post Office, 1962; and O. D. Dickerson and M. Kawaja, "The Failure Rate of Business", in Irving Pfeffer, (ed.), The Financing of Small Business, New York: Macmillan, 1967, pp. 82-94.

echoed by observers in Canada:[24/]

> "When, at some stage of recovery, a spirit of wild optimism develops, very large numbers of people with floating occupations, probably people most of whom could not make the grade anywhere, invade the cyclically-sensitive trades, setting up businesses of their own with hardly any experience and even less capital. They do not keep any books, their costing is extremely poor, and in any case, for a period they are prepared to continue in business, even if they are making hardly any profit, in the belief that difficulties will somehow miraculously disappear with the passage of time. These people compete with established businesses for scarce capital and materials as well as attracting labour from them. This makes the going harder for sound businesses, and more especially because the 'invaders', through bad costing and recklessness, are 'able' to undercut. Thus, paradoxically enough, business strains may develop, although investment expenditures and, consequently, total expenditures are high...."

The findings for Canada on the relationship between the construction cycle and construction bankruptcies shows this pattern applies, but the total numbers are not extensive. That is, there are bankruptcies even in booms but the cycle alters the total value (specifics later). Also, the manpower study by

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[24/] K. Bieda, "Bankruptcies in Depression and Boom", Economic Record, August 1957, pp. 182-190.

R. A. Jenness has found a substantial mobility into construction occupations from other occupations but no attempt was made to estimate movement from skilled worker into proprietor status in construction.[25] It would not be surprising if such a result was to be found however since entry is easy and the number of proprietors has grown in almost every year since 1954. The most likely source of these entrepreneurs is the construction trade employees who have the requisite trade skills and some entrepreneurial ambition.

It seems then that increased bankruptcies, and other exits, would be observed with some short time lag after a cyclical upturn had been achieved and a further increase after the downturn had begun. Data on exits and entrants is not available so we cannot identify the real rate of firm turnover, but we can identify some bankruptcy patterns.

Empirical Findings on Bankruptcy

1) The Bankruptcy Rate

First, there is the comparison of the rate of bankruptcies among different industries. Data that can be used is available for the period from 1956 to 1969. Table 4.18 shows us the rate of bankruptcies as

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[25] R. A. Jenness, labour study for Economic Council Reference on Construction Instability, forthcoming.

a percentage of the business firms, both proprietors and corporations, in several industry groups. It has to be recalled that these are the extreme failures of bankruptcy and not the total business exits in any group. This omission may not be trivial because differences in the mode of exit can exist. That is, failure is not restricted to bankruptcy. Some businesses are more easily sold as a going concern to a new entrepreneur, or by having fixed assets available for sale can lead to negotiated liquidations instead of bankruptcy.

In terms of the mean rate of bankruptcy "Construction", at 86.5 per ten thousand firms, ranks below "Manufacturing" at 90.5, but above "Wholesale and Retail Trade" with a mean bankruptcy rate of 70.5 and "Services" with a mean rate of only 40.5. Variability of this rate can be measured in several ways. The average deviation from the mean rate is very close when "Services" at 18.5 are compared to "Construction", at 19.9. "Wholesale and Retail Trade", at 15.6 is not too far away while "Manufacturing", at 6.9, is quite a bit lower. When one examines the ratio of the peak rate value to the trough rate value "Construction" is most volatile, but again the rate for "Wholesale and Retail Trade" is not far away. "Manufacturing" is lowest in volatility by both measures.

The conclusion then is that construction has a bankruptcy rate that is not the highest of the selected groups but that the volatility of this rate is highest,

Table 4.18

INTERINDUSTRY COMPARISON OF BANKRUPTCY RATES,
ALL CANADA, 1956-1972,

Numbers of Bankruptcies per 10,000 Firms*
Industry Group

Year	Manufacturing	Wholesale and Retail Trade	"Services"	Construction
1956	93	56	32	77
1957	102	65	29	77
1958	95	62	34	73
1959	96	61	36	84
1960	94	77	40	109
1961	81	75	44	80
1962	89	88	54	98
1963	103	97	59	124
1964	91	86	53	121
1965	94	77	45	101
1966	90	69	41	85
1967	81	58	35	66
1968	77	57	32	60
1969	81	59	34	56
Mean Rate	90.5	70.5	40.5	86.5
Per Cent Average Absolute Deviation	6.9	15.6	18.5	19.9
Peak/Trough Ratio	127	173	203	221

*"Firms" includes proprietors and partnerships as per individual tax returns plus corporations as per corporate tax returns.

Sources: Statistics Canada and Department of National Revenue.

although not much more than for some other groups. Certainly the construction industry does not appear to be dramatically out of line with regard to its bankruptcy rate when compared to other industries. This is not to say it is in good shape, or bad considering the type of risks, only that an extreme failure resulting in bankruptcy does not set this industry very far apart from other types of business.

2) Cyclical Effects

a) Expenditure

Secondly, the role of construction bankruptcies and the business cycle needs to be reviewed. First a simple comparison is presented. Table 4.19 presents the data on the share of construction bankruptcies in total business bankruptcies over the period 1956 through 1972. Throughout this period, construction as a proportion of total bankruptcies, remained within a fairly narrow range around 18 per cent. A correlation calculation for the two sets of data brings a value of .899, very high. This indicates that, whatever the general reasons for the aggregate trends, the effect was nearly the same on construction as on other businesses. In fact, during the period between 1964 and 1971 the relative role of construction bankruptcies has shown a downward pattern, albeit a small trend.

The data were subject to statistical analysis for linear trends, that is for direct straight relationships. Construction bankruptcies and the rate of

Table 4.19

SHARE OF COMMERCIAL FAILURES
ARISING FROM CONSTRUCTION INDUSTRY,
ALL CANADA, 1956-1972

Year	No. of Failures Reported		Share Held By Construction (Per Cent)
	Construction	All Business	
1956	375	1,966	19.1
1957	372	2,198	16.9
1958	367	2,125	17.3
1959	449	2,229	20.1
1960	619	2,828	21.9
1961	470	2,659	17.7
1962	573	3,190	18.0
1963	714	3,677	19.4
1964	706	3,499	20.2
1965	628	3,295	19.1
1966	559	3,007	18.6
1967	451	2,631	17.1
1968	442	2,516	17.6
1969	440	2,699	16.3
1970	490	3,281	14.9
1971	465	3,270	14.2
1972	556	3,046	18.3

Source: Statistics Canada, Commercial Failures, Bulletin 61-002, Ottawa: Queen's Printer (now Information Canada), Quarterly.

construction bankruptcies were compared to actual levels and deviations from trend values in construction expenditure and GNP, with two exceptions, no statistically significant results were obtained. The Durbin-Watson statistics were low, an indication of the fact that a linear relationship is not the correct one and that other more important variables influence the results.

The two patterns that did show some statistical indication of being related were construction bankruptcies and their rate when compared to a one year lag of the deviation from trend of constant (1961) dollar value of GNP, this latter value being used to represent general business conditions. The choice of a one-year lag is to represent the business practice whereby full accounting for the year's business, including the usual creditor recognition lags. These comparisons showed only partial explanatory influence, although it was in the expected direction, that is, a rise in bankruptcies was related to a GNP value below the trend. The interpretation must be that a decline in GNP this year will tend to increase construction bankruptcies next year. A comparison of the pattern of total bankruptcies and nonconstruction bankruptcies yields similar results.

The data all show that the time trend of all bankruptcies is highly peaked, with the high point in 1963. The reasons for this are not entirely clear, nor particularly discernable from the available data. The trends were distributed to all groups at the same time.

This pattern has created some problems for analysis but the conclusions stated are not particularly sensitive to these matters.

A second way to look at the time series data is to examine the patterns and distribution of changes between construction and total bankruptcies. Doing this one sees that in thirteen of the sixteen time periods reviewed construction bankruptcies changes in the same direction as total bankruptcies, five of those years being upward changes and eight being downward changes. The two groups moved in opposite directions between only three widely dispersed periods. In those times when they both changed in the same direction construction's share was consistent with its role in the total, except for two periods, 1957-58 when 79 per cent of the increased bankruptcies were in construction and 1960-61 when 88 per cent of the decreased bankruptcies were in construction. In 1970-71 when nearly compensating changes occurred in the "other" category, and the three periods when the changes were in opposite directions, the use of percentage contributions can be misleading. In the four years when total bankruptcies grew quite substantially, construction's role was not very different from its share of the total. The two years when substantial declines came in total bankruptcies, saw a similar pattern for the role of construction. Finally, the correlation coefficient between construction expenditures, in 1961 dollars, and construction bankruptcies was calculated. It comes out at .0393, a very low value indeed, meaning that these two activities do not move together.

b) Profits Cycles

The most useful comparison for cycles was made by comparing the value of profits with the number of bankruptcies. Not unexpectedly the effect was that profit levels were related in statistically significant ways to the rate of bankruptcies. When total profits, and when "average profits"[26] per firm, were low the rate of bankruptcies was higher than when these explanatory values were high. Both current year and previous year data held this pattern. The following table sets out the material in descriptive form. If we take the statistical analysis techniques of regression we find that these relationships were not strong. Not even half of the variation in the bankruptcy rate was explained by average firm profits.[27] Obviously, other factors are quite important but they were not identified.

As a conclusion then we must opt for the statement that bankruptcies are influenced by the cycle, especially because this affects profits, but this source of bankruptcy is clearly only a partial influence. The cycle certainly is not the predominant influence because there is a base rate of bankruptcies that approximates 72 per cent of the seventeen-year average number of bankruptcies.

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[26] "Average profits" is the sum of corporate profits and unincorporated business income divided by the total number of such firms. This is a weak indicator.

[27] Comparison of the numbers of bankruptcies and the total profits yielded no statistically significant results. Use of numbers of bankruptcies and "average" profit gave R^2 of .25 for current year and .32 for one year lag, but these values coincided with Durbin-Watson values below the lower limit for acceptable analysis. "Average profits" and "bankruptcy rates" gave R^2 of .45 for the current year (but a D-W below the limit) and of .53 for the previous year (with an acceptable D-W which should not be affected in this case by the use of lags).

Table 4.20

BANKRUPTCY AND PROFITS CYCLES IN CONSTRUCTION, 1956-69

Year	Average Firm's Profit[1]	Number of Bankruptcies	
		Total	Cyclical Effect[2]
1956	8.0	375	8
1957	9.2	372	5
1958	9.5	367	0
1959	7.7	449	82
1960	5.8	619	252
1961	6.2	470	103
1962	6.1	573	206
1963	6.8	714	347
1964	7.3	706	339
1965	8.6	628	261
1966	10.0	559	192
1967	10.2	451	84
1968	9.6	442	75
1969	9.4	440	73

(1) This is a very weak indicator because of the extensive variation in size of firm, but it does show some indication. It is based on corporate and unincorporate firms together, in thousands of current dollars.

(2) This is the number above the "base" or lowest year, which was 367, and was used to estimate the minimum value of "normal" bankruptcy expectations. The extra is the cyclical effect.

3) Intraindustry Patterns

a) Types of Contractor

Another possible comparison is the distribution of bankruptcies within the industry, first between general and trade contractors and next by size. In the period from 1959 to 1970 distribution by type of firm remained very close to 60:40, with special trade contractors having the 60 per cent. In the earlier period, between 1956 and 1958 it was nearly a 50:50 split, with the change coming about in 1959 when almost all of the change in total bankruptcies fell upon special trade contractors. More recently, between 1970 and 1972, the pattern was reversed to a 40:60 division when special trade bankruptcies decline about 15 per cent while general contractor bankruptcies rose about 70 per cent. No particular reason for either shift has been found. Table 4.21 shows the data.

b) "Size" of Contractor

It is also possible to look at the bankruptcies by the size of declared liabilities, the only size category adopted by the bankruptcy office in its statistics. One cannot be sure how well this measure is correlated with other size criteria. And, we do know that the values are gross values, prior to settlement. Also, they are considered to be subject to important estimating errors. Table 4.22 shows this data for Construction and All Business, for four selected years during the period for which data are available. In both groups the long-run trend has been to concentrate a larger share of the bankruptcies in higher size categories.

Table 4.21

INTRACONSTRUCTION DISTRIBUTION
OF BANKRUPTCIES, BY TYPE OF CONTRACTOR,
ALL CANADA, 1956-1972

Year	Reported Construction Bankruptcies					
	General Contractors		Special Trade Contractors		Total	
	No.	%	No.	%	No.	%
1956	187	49.9	188	50.1	375	100
1957	204	54.8	168	45.2	372	100
1958	174	47.4	193	52.6	367	100
1959	177	39.4	272	60.6	449	100
1960	279	45.1	340	54.9	619	100
1961	195	41.5	275	58.5	470	100
1962	244	42.6	329	57.4	573	100
1963	273	38.2	441	61.8	714	100
1964	308	43.6	398	56.4	706	100
1965	243	38.7	385	61.3	628	100
1966	219	39.2	340	60.8	559	100
1967	193	42.8	258	57.2	451	100
1968	177	40.0	265	60.0	442	100
1969	168	38.2	272	61.8	440	100
1970	186	38.0	304	62.0	490	100
1971	223	47.9	242	42.1	465	100
1972	319	57.4	237	42.6	556	100

Source: Statistics Canada, Commercial Failures, Bulletin 61-002, Ottawa: Information Canada, Quarterly.

Table 4.22

DISTRIBUTION OF THE NUMBERS OF BANKRUPTCIES
BY "SIZE", SELECTED YEARS, ALL CANADA

Size* ($'000)	1956	1963	1969	1972
		Construction		
Under 5	13.1	8.2	2.1	0.9
5 to 25	48.5	45.9	38.2	32.0
25 to 50	18.9	21.8	21.6	26.6
50 to 100	11.5	12.2	18.6	17.8
Over 100	8.0	11.9	19.5	22.7
	100.0	100.0	100.0	100.0
Average Size*	44,765	56,280	81,725	111,370
		All Business		
Under 5	17.9	10.2	3.3	1.8
5 to 25	54.3	50.7	46.3	40.8
25 to 50	15.4	18.8	22.7	25.7
50 to 100	7.8	9.9	13.5	18.0
Over 100	4.6	10.4	14.2	14.2
	100.0	100.0	100.0	100.0
Average Size*	32,666	53,196	78,216	100,870

*"Size" represents the estimate of gross outstanding liabilities at time of filing bankruptcy papers. See text for discussion.

Source: Statistics Canada, Commercial Failures, Bulletin 61-002, Ottawa: Information Canada, Quarterly.

Most of this shift is probably due to inflation rather than to any real shifts in the pattern of failures. In 1972, approximately 60 per cent of the number of bankruptcies had less than $50,000 of outstanding liabilities, compared to 65 per cent for All Business in total. Simultaneously about 23 per cent of construction bankruptcies were over $100,000 in value, compared to only 14 per cent for All Business. The basic pattern of distribution was the same in earlier years, that is the portion of construction bankruptcies coming in the largest size categories exceeded that in those same categories for All Business. The opposite situation applies to the smaller categories of course.

When the average value of unpaid liabilities for bankrupt firms is reviewed, for both Construction and All Business, the Construction industry exceeds the All Business group in 12 of the 17 years examined, by an average of 21.5 per cent. Construction bankruptcy values were higher than the All Business average for construction from 1956 to 1959, again in the period 1961 to 1964 and from 1969 to 1970. The average values of construction bankruptcy were below the general average value in only five of the seventeen years, specifically 1960, 1965, 1966, 1968 and 1971. The average for these years was 10 per cent below the All Business values. The amount by which the average construction firm's liabilities exceeded those of All Business was only 12 per cent for the whole period under review. We do not know to whom the liabilities were owed, but materials suppliers are considered to be more likely to be unpaid than labour.

The trend of average values has been upwards due to inflation. Data are presented in Table 4.23.

Some data is also available on the size of the liabilities of the bankrupt firms within the Construction industry. Table 4.24 shows the average values for four selected years for Special Trade Contractors and General Contractors. In all years the average liabilities are smaller for the Special Trade Contractors, often by sizeable proportions. This is not particularly surprising considering that a general contractor may owe money to several special trade and contractors due to the way these businesses arrange themselves.

Another interesting comparison is between the average amount of unpaid liabilities among various industries. A generous selection from the year 1972 is presented in Table 4.25, with both the average value of unpaid liabilities per firm and an index comparison of all groups to All Construction shown. It is evident that some groups, such as Household Furniture Trade firms, have an average unpaid liability value less than half that for All Construction. But it is also clear that many groups have average values several times that of Construction. For example, the values for Drug Traders is two and one-half times that for construction. This is not an atypical year, although the exact relative values differ at other times. A comparison can also be made of the total unpaid liabilities of the industry group. In 1972 Construction was $61.9 million, about 67 per cent of the Manufacturing sector's $92.5 million, and about 160 per cent of the $38.8 million applicable to the Finance,

Table 4.23

AVERAGE SIZES OF CONSTRUCTION FAILURES COMPARED TO ALL BUSINESS FAILURES, 1956 to 1972

Year	Average Estimated Liabilities at Failure*		
	Construction	All Business	Ratio (c/a)
1956	44,765	32,666	137
1957	52,882	35,636	148
1958	44,708	34,248	130
1959	40,924	34,956	117
1960	58,586	61,721	94
1961	50,351	43,821	114
1962	47,842	46,846	102
1963	56,280	53,196	105
1964	70,787	59,655	118
1965	83,256	99,929	83
1966	69,592	82,297	84
1967	121,828	77,076	158
1968	62,462	71,834	86
1969	81,725	78,216	104
1970	90,524	78,527	115
1971	98,271	98,487	99
1972	111,372	100,867	110

*Values are based on estimates made of the gross outstanding liabilities at the time of declaration of bankruptcy in current dollars.

Source: Statistics Canada, Commercial Failures, Bulletin 61-002, Ottawa: Information Canada, Quarterly.

Table 4.24

INTRACONSTRUCTION
DISTRIBUTION OF BANKRUPTCY BY SIZE* AND
TYPE OF CONTRACTOR,
SELECTED YEARS, ALL CANADA

	1956	1963	1969	1972
General Contractor	56,037	85,234	95,012	147,476
Special Trade Contractor	33,563	38,356	72,518	62,789
All Construction	44,765	56,280	81,725	111,370

*Size refers to estimated gross unpaid liabilities at the time of declaration of bankruptcy.

Source: Statistics Canada, Commercial Failures, Bulletin 61-002, Ottawa: Queen's Printer, Quarterly.

Insurance and Real Estate sector. In the period 1956 to 1972, the share of Construction in total unpaid liabilities of bankrupts, was, on average, 20 per cent, with a range from 13 to 27 per cent.

Non-Bankruptcy Exit

As stated earlier, not all exits come via the serious route of bankruptcy. Data on this other exit is not very complete. Elsewhere, in the discussion on proprietors, it is shown that the number of businesses has been rising throughout the period, although not in all years.[28] There is no turnover data available on

[28] The growth rate of total firms was 3.4 per cent per annum over the year 1956 to 1972. Declines occurred in only 1961-62 and 1962-63.

Table 4.25

AVERAGE SIZE* OF COMMERCIAL FAILURES,
BY SELECTED INDUSTRY,
ALL CANADA, 1972

Industry Group	Size of Estimated Liability of Bankrupt Firms	
	Value	Index to Total Construction
Primary Industry	62,020	55
Manufacturing Industries	409,137	367
Food and Beverage	138,125	124
Textiles	401,444	360
Wood Industries	560,035	502
Paper and Allied	779,230	700
Primary and Fabricated Metal	303,294	272
Electrical Products	378,200	339
Chemicals	92,000	82
Other	202,500	181
Construction	111,372	100*
General Contractors	147,476	132
Special Trade	62,789	56
Transport, Communications and Other Utilities	41,870	37
Trade, Wholesale and Retail	54,309	48
Food	51,243	46
General Merchandise	106,317	95
Hardware	59,446	53
Household Furniture	45,192	40
Drugs	273,111	245
Finance, Insurance and Real Estate	511,368	459
Services	47,438	42
Business	63,000	56
Personal	37,334	33
All Businesses	100,867	90

*This is the estimate of gross unpaid liabilities at the time of the declaration of bankruptcy. See text for discussion.

Source: Statistics Canada, Commerical Failures, Bulletin 61-002, Vol. 51, No. 4, Ottawa: Information Canada, March 1973.

this, however, although we do know that it exists in the regular forms of merger and business failure other than bankruptcy. But, in addition we must also consider a practice of using the corporate veil as a device for operating a business.

It is quite proper and legal for a business entrepreneur to seek to adopt a limited liability corporation as his vehicle. This practice is a legitimate way to operate. It enables easier participation of a larger number of investors than the partnership. It reduces the risk borne personally by the entrepreneur, and as is discussed elsewhere, this is the one group of the various market participants which is unable to pass off some of its risk. A specific manner of using this legal device to dispense risk even farther is to adopt a series of affiliated or subsidiary companies. The land and project developers use this more often than actual construction firms, but both do it. Each specific firm will have a portion of the total enterprise in its own venue and if for some reason its losses create a failure than it need not bring the whole chain down, although it can since creditors often want security of guarantees from parents or affiliates. However, the reason to raise it is to note that some exists will be the result of a corporate shell being voluntarily closed up after a specific project is finished. If this apparent "exit" just reforms under another corporate guise for the next project then the data would give spurious results if analyzed. Our results cannot be so since the data is unavailable, but this practice should be recognized as

one that operates in the construction industry, quite possibly more than elsewhere because of its capacity in controlling risk. Additionally, this practice will give upward bias to the total number of corporate firms if we want to adopt sets of entrepreneurial skills as the measure of firms.

Summary

In sum then, we have found that the total of construction industry bankruptcies moves very closely with the trend of overall bankruptcy, that the bankruptcy rate in the industry is not the highest but is in the upper range, that the bankruptcy rate is the most volatile in construction but is not particularly different from that in other industries, that construction bankruptcies involve higher estimated liabilities at the time of filing than all bankruptcies but that several groups have much greater average sizes of their bankruptcies. But, even more important for this study, it has not been possible to link construction bankruptcies to the construction cycle in any strong and identifiable way. In some ways this is contrary to original expectations but it is based on trustworthy data and well established analytical procedures. As always, bankruptcy represents a real cost to the economy because for a while some resources must have been quite definitely misallocated. However, curing, or reducing the construction cycle appears to offer little chance of reducing this specific cost. Bankruptcy in construction is mostly a problem of microeconomics not macroeconomics.

CHAPTER 5

GENERAL ELEMENTS OF CONDUCT

5.1 Introduction

Keeping in mind the orientation of the Reference under whose auspices this work is being done, we now consider some elements of conduct related to the construction industry and the business cycle. Are there features of conduct that amplify or modify the cycle? Does the cycle affect elements of conduct?

Basically there are few elements of what industrial organization studies consider "elements of conduct" that can amplify the cycle. These features may influence who gets the contract, for example such tactics as price collusion, but they do not alter those features found by other studies to influence demand.[1/]

Two items of conduct with possible cyclical impact are pricing practices and output flow practices. However, as was discussed in Chapter 3, price changes have little impact on the flow of demand and output control is neither technically nor economically feasible. The myriad of specific practices used in other industrial studies therefore do not come up as important for this study. Of course there are many special features of the industry relevant to a "conduct" study, but not for a cyclical study. In spite of this dry well, it is helpful to look at several

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1/ See companion studies by J. H. Chung, N. M. Swan, and L. Auer, Economic Council, Reference on Construction Instability, for the analyses of the nature of demand, e.g. price and income elasticities. See also, supra, Chapter 3.

specific areas in detail and to come up with a review. The review of surety bonds and mechanic's liens is the most extensive because they offer a means to reduce risk in this industry and the cycle is said to amplify that influence on the construction industry.

5.2 Competitive Practices

Competitive practices are those procedures which the members of the industry use in relation to each other when they seek to obtain contracts. Bidding is the main practice, and some discussion is presented. Next follows some brief review of the anticompetitive experience in this industry, and finally a discussion of the use of special purpose corporations.

Bidding

The standard method of selecting construction contractors is the bid tendering system. Several variations exist, the most prominent of which are: (1) invited bids in which specific firms are asked to submit offers, (2) controlled bids in which only those firms meeting a specific set of prequalification criteria are accepted as bidders, and (3) open bids in which any firm is allowed to propose its offer. The choice is, of course, at the option of the buyer who called for the tenders. Acceptance of the bid is also at the option of the buyer. Usually the acceptance is based on price as the prime consideration because the project specifications have been finalized and made available to all potential bidders in advance. However, basic commercial reputation, time scheduling, or other criteria are validly taken into account where such differentiating may be significant.

Various legal and procedural practices exist without such economic significance, but there are some important economic questions about the efficiency of a system in which a series of separate firms each make a detailed estimation of the projects costs. Only indications of answers to these questions are presented here.

Bid preparation costs are basically selling costs. Sometimes they do not prove to be successful in winning the sale. They are a risky investment by their very nature with these risks being related to all dimensions of the bid such as accuracy of inputs, prices, and time, in addition to the basic risk inherent in the competitive process.

If one treats each project as a separate market then one can consider the failure to win the bid as analagous to an unsuccessful attempt at entry or at least at expansion. There is some justification for taking such a perspective in order to illustrate one causal element in the very flexible industrial structure. Attempt at entry is always contingent on successful bidding. The bidder must have the capacity, at least potentially, to win the bid, but if having that capacity raises fixed costs, his expected loss by failing to win the bid is expanded. By contrast, if that capacity is represented by variable costs, then the expected loss will be less. This riskiness and the expected values of loss due to failure to win the bid create strong economic incentives. Insofar as fixed costs are important, the incentive is, in the long run, to lower bidding because each bidder wants to minimize his costs of idle capacity. But because these are high there is an incentive to

structure the firm so as to reduce the fixed cost component. These two forces affect the structure of the firms and the industry structure and price reactions.

It has been shown that this industry experiences vast shifts in firm size from year to year, that these firms have higher than average debt/equity ratios, that the fixed/variable cost ratios are lower than average, and that the labour supply is typically acquired by firms as they need it for short time periods.[2/] All of these go together in a behavioural syndrome. Unstable aggregate construction volume, the so-called cycle, is only part of the problem for it is the irregularity of volume to each firm which induces these behavioural patterns, and the bid system along with lumpy sales increments only reinforces them. Bidding is not caused by the cycle nor does it influence the cycle. Rather it operates, as a procedure, independently.

When aggregate sales slump one can reasonably expect bidding to become more rigorous and profit margins to decline. The structure of the industry ensures this feature. Established consensus and, unfortunately, very little available data also support this reality. This means that the competitive system is operating the way it was designed to operate. And, it must be recalled here that at its heaviest, in 1963, it did not result in a bankruptcy rate of more than 1.25 per cent of the firms,

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[2/] See companion studies by P. Laverty, B. A. Keys, M. R. Prentis, and P. Malles for specific analyses of these features.

only half of which could be clearly linked to the cycle. This pattern, it must be reiterated, does not amplify the business cycle nor does it reduce it. Competitions are entered after the buyer has decided to build and the cheaper prices do not induce a compensating expansion when a downturn has begun.[3/]

This brief review does not examine the many intricacies of the bid system, especially the interesting phenomena attached to it in terms of competitive practices. However, it does set out the main procedures and note that price responsiveness is not a cyclical influence in the construction industry. This means that policy changes concerning bidding can be instituted without fear of cyclical disruption.[4/] The converse also holds, namely that changes in cyclical phenomena cannot be expected to alter bidding procedures.

Competition Law

The construction industry is quite probably under the obligations of the Combines Investigation Act which prohibit collusion, retraints of trade, price-

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[3/] See Section 3.4 above for more elaboration.

[4/] The bid system, especially the use of central bid depositories that have removed a lot of the "chaos" from the practice, has been the subject of an exhaustive study by the office of the Director of Research, Combines Investigation Act, Consumer and Corporate Affairs Department, Ottawa. Unfortunately, it has not yet been made public. Officials there generally agreed with the theme I note, however.

fixing, and so on.[5] They are also covered by what will become a revised Competition Act. How have they behaved?

A survey of the 84 reports under the Combines Investigation Act since 1945 shows 4 were directly related to construction while 13 were related to construction supplies.[6] This experience is not necessarily representative of the actual practices, but it is a partial indicator. Some suggestion has been made that collusion is more predominant in the downturn of the cycle but this particular evidence is not sufficient to support such a statement for construction firms as such.

The most likely type of behaviour is collusion to allocate markets and to discourage geographical dispersion of firms from one zone to another.[7] Bid peddling as it is called, a process of colluding related to tenders and their values, has results in bid depositories when the industry felt these tactics were causing internal disincentives.

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[5] Combines Investigation Act, Sections 32, 33, and 34. The clear, general applicability is in doubt. Cases have come on both sides as to whether construction is excluded. See discussion in Economic Council of Canada, Interim Report on Competition Policy, Ottawa: Queen's Printer, 1969, pp. 135-136, 142, 146 and 170-171.

[6] Reports by the Director of Investigation and Research, are made when he examines a problem. The Restrictive Trades Practices Commission also publishes its reports.

[7] See for example, Restrictive Trade Practices Commission, Road Surfacing in Ontario, Ottawa, 1964.

In sum then this potentially interesting area is probably affected by the cycle but it does not in itself amplify the cycle. It was this latter reason that keeps the examination minimal here.

Corporate Veil

Corporations are separate legal persons which are created for specific purposes. They come into existence at the request of any citizen; their domain of activities is restricted; their exit can be whenever the law permits or obliges it. That is to say they are very constrained entities.

One specific feature of corporations is the limited liability they bear. Except in the case of fraud the owners of a corporation are not obligated to pay more than the par value of the share (where this still exists) even if the corporation incurs debts many times that value. Modern financing could not persist without this vital fact.

An operating feature in commerce is the use of a separate limited liability corporation for a separate business venture.[8/] Subsidiaries are a common example. They may or may not operate with the explicit financial backing of the parent or affiliate.[9/] Construction is

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8/ N. H. Jacoby, "The Myth of the Corporate Economy", in An Anthology of Studies of Industrial Concentration by The Conference Board: 1958-1972, New York, 1973, Section XII, pp. 1-35.

9/ The same situation exists in personal finance where friends or family may act to guarantee one's debts but it cannot be presumed that the parent will stand up for the son's debt.

no exception. Some say it is more general here but we do not have clear data. Is it a practice to be discouraged, or ignored?

The answer to this question depends on the expected harm that one would reduce by restricting the use of the corporate veil to isolate separate activities. The type of problems reported to the Reference in this area were usually those connected with problems of debt collection by suppliers and workers. Generally these are separate problems best handled by a direct approach.

But what of the cycle? Does the easy entry not amplify it? My answer is clearly a negative one. If the corporation, whether new or old, has no projects then its mere presence will not induce demand. And, the withdrawal of a corporate entity is not the same as the withdrawal of real resources from the economy, especially where a contract system and extensive leasing are adopted. For cyclical purposes the use of separate legal corporations has no effect. In spite of many expressions of opinion on this situation, no credible operating mechanism for such a linkage was presented to support the idea which seems to thrive in the folklore about this industry.

5.3 Risk Avoidance

As in all business, risk is a basic component of the environment of the contract construction industry. Risks to the firm arise from such things as employee error, casualty, creditor default, crime, etc. Each participant in the industry faces risk and he can take several kinds of action to reduce the risk. Of specific interest to

this study are the following two concerns: (1) the risk to the buyer of failure to complete the contract according to its agreed terms, and (2) the risk to all suppliers of failure to be paid for work performed or materials supplied. Among the specific devices or procedures related to these risks are: (1) selective prequalification of bidders, (2) holdback of payments pending completion of contracts, (3) security deposits, (4) surety bonds, and (5) mechanics' liens. The last two of these are of sufficient importance to warrant some discussion and review in this study.

Prequalification is a system used by frequent buyers of construction services. It uses a list of contractors whose bids it will review when work is available. It was discussed earlier as an entry barrier. As a means of reducing risk its role is small, and that role is boosted by the use of surety bonds. Holdbacks are amounts not paid to a contractor until the work has been satisfactorily completed. Buyers use it as an insurance against poor quality work. Amounts are negotiable. Both of these practices can cause short-term financial strain for a construction firm, but this is not significant as a cause of the cycle's size or duration.[10/]

Now let us turn to surety bonds and mechanics' liens and examine their role.

[10/] This point is based on my main theme that the cycle is unaffected by the contracting industry. For a more detailed review of the financing, and some somewhat different views, see the companion study by P. T. Laverty for the Economic Council of Canada, Reference on Construction Instability, forthcoming.

5.3a Surety Bonds

The surety bonding industry has an important role to play in the construction industry because it affects risk allocation, entry barriers, and the "quality" of the firms in the business. Since these may have some effect on the industry's reaction to cyclical demand shifts the surety industry warrants some review.

Why Use Bonds?

Many buyers of construction expect or require that a contractor will provide some kind of security so that, in the event that the contractor is unable to complete a job, there will be funds available to have someone else finish it. One way of encouraging completion and reducing the risk of not having the job done according to the agreed terms is to make the contractor pay a penalty for non-performance. A security deposit that is forfeited in the case of default is another common device to promote satisfactory completion of a contract. It is in this context that several types of surety bonds are used in the construction industry.

Non-performance on a contract is costly. In the first instance the buyer bears the cost of late, or even foregone delivery of his project. But additionally, there may be extra costs of having to reorganize a construction team, suppliers may go unpaid for delivered and installed goods, etc. The bonding system is an attempt to reduce the buyer's risk of such extra costs and to pass this risk elsewhere, although the real costs will utlimately be borne by the final buyers in one way or another anyway.

Bonds may apply to the full value of the project or only part of it. The terms usually include an upper limit but this only puts a ceiling on the size of the contingent liability and does not alter the basic principle or purpose.

What are Surety Bonds?

Legally, several relevant distinctions between bonds and regular insurance should be kept in mind.[11/] In essence, insurance is risk sharing and costs are borne by a common pool of premiums. Suretyship by contrast is not really risk sharing. It is in part a guarantee, that is an aggreement to stand up in another's place if the other fails is some way to meet his obligations, and in part an idemnity, an agreement to make up for losses caused by a third party. Unlike insurance, the surety has a basic right to claim back on the one whose failure causes the surety to act to fulfill the terms of the bond. This right of subrogation means that the contractor is not freed from his obligations and liabilities just because he has a bond so there should be no incentive to default created by the bonding system. These legal facts hold even though almost all surety business is done by firms which are also in the insurance business.

Some have called surety bonds a form of credit, which, in some ways they are. The surety adds his resources to those of the

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11/ J. Backman, Surety Rate-Making, A Study of the Economics of Suretyship, New York: The Surety Association of America, 1948, pp.25-50.

bonded company, for each specific contract, and in this sense provides a security by the granting of contingent credit. If the contract terms are fulfilled, then no cash moves from the surety. Of course there is a real cost, and a charge, for the access to this contingent credit. The rates will depend on the usual features, including an opportunity cost to the money, the degree of risk or loss, and other typical credit related characteristics.[12/]

There are many kinds of private contracts and conditions in which one seeking fulfillment of the contract might seek this extra surety for his own interests. Since private contracts have few legislative constraints, the terms are those to which the parties may agree but most trade groups adopt standard forms of contract. Those used in the construction industry are the ones of interest to us of course, and there are four main types, each of which relates to a different portion of the whole series of business relationships involved in construction. These are: (1) bid bonds, (2) performance bonds, (3) payment bonds, and (4) maintenance bonds. A description of each follows.

Bid Bonds

A potential buyer of construction seeks to know that those who submit tenders on a project will in fact be ready, willing

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12/ G.D. Cox, "Surety Bonds-Criteria in Construction Company Surety Credit", Text of Speech at Annual Meeting of the Canadian Construction Association, Saskatoon, January 30, 1973.

and able to enter into an actual construction contract if the bid is accepted. To encourage this they often ask for bid bonds under which they will be paid the difference between the costs to be expected from completion of a project by the accepted bidder and that one would have to pay a second contractor to complete the project if the first bidder fails to act on his accepted tender. For illustration, assume A and B bid $100,000 and $102,000 respectively to build a gasoline station. The oil company accepts A's bid but then A refuses to enter into a contract for construction. The oil company then turns to B to build the station, and the Surety pays the difference of $2,000, prior to seeking the money from A who defaulted.

Performance Bonds

These bonds follow the same principles and procedures as the bid bond, except that here the relevant contract refers to the actual completion of the construction project. If contractor B fails to complete the project and leaves $20,000 of construction undone, then the Surety which issued the performance bond would make this amount available for contractor C to complete the job. The Surety would still have a claim against B however, which he may not be able to collect. Such bonds can exist in contractual relationships between contractors and subcontractors also, under similar arrangements and terms.

Labour and Material Payment Bonds

As the other bonds are surety agreements related to the performance of certain carefully specified obligations, so too are

labour and material payment bonds. Here the relevant agreement is that concerning payment of workers and material suppliers. These are separate from the provisions of the Mechanics' Liens Acts but serve to protect the buyer as well as the workers and suppliers. Under these bonds the Surety agrees to pay the suppliers of material and the labourers of the Contractor fails to do so. These bonds protect the buyer against claims under the Mechanics' Liens Acts and give him a lien-free title to his project upon completion.

Other Surety Devices

Sometimes a construction firm contracts for warranty and maintenance of a project. Surety bonds are also available here to support these specific contractual obligations. Agreements to supply material can also be indemnified.

"Consents of Surety" or "Bid Letters" are sometimes used and accepted in some circumstances as indications that a bond will be obtained if needed although some have questioned the true legal status of these devices.[13/]

Another legal device sometimes used is the "third party indemnity" agreement. Under this an additional guarantee is obtained

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13/ D.T. Warren, "Construction Bonding - Some Problems, Some Suggestions", Text of a Speech at the Annual Meeting of the Canadian Construction Association, Saskatoon, January 31, 1973.

by a surety company in order to provide extra security to itself. One illustrative example would be where the construction firm, usually an incorporated firm, has insufficient financial strength on its own to justify a surety bond being issued. If others, usually the owners of the firm, can provide some alternate form of security to the bonding company a bond can be issued. In a sense this defeats one basic purpose of the limited liability company, but that purpose can sometimes be a weakness as much as a strength. If an owner has his own personal assets behind his management decisions, he is likely to be more careful. And of course, fraud behind a corporate veil has not been known in this industry, and the third-party indemnity agreements make it less likely.

The Surety Industry

Surety bonding is handled by firms that are also in the regular insurance business. In 1970 there were 130 federally chartered firms providing surety bonds. Their total surety premiums were $21.9 million.[14/] While this figure represents only 0.2 per cent of total contract construction, it does not represent the value of construction bonded. The industry reports that about 90 per cent of total surety bond premiums are related to construction contracts.[15/] Using an estimate average premium rate of $5 per $1,000 of coverage and calculating the estimated value of contract construction.

14/ There is extensive data available on this industry in the Report of the Superintendent of Insurance, Ottawa: Queen's Printer, annual.

15/ Correspondence with the author from the Surety Committee, Insurance Bureau of Canada, supports these values.

covered by bonds one finds a mean of 34 per cent for the period 1961 to 1971, but there was clear growth for this rate over the period. This pattern could be accounted for by a combination of real growth in the share of construction projects actually bonded plus a larger share of each project's value being bonded. Unfortunately data do not identify how these factors contribute. It is also to be noted that because partial coverage is possible, that is only part of the total project is bonded, which means that a greater volume of construction is affected by bonding than the figures indicate.

In 1970 the four largest federal bonding firms held 38 per cent of the direct premium business, and the eight largest held 60 per cent. Some insurance firms do very little surety business, even none at all, while the largest firm, the Canadian Surety Group, did $2.4 million in 1970, about 13 per cent of its own total direct premium revenue. Since 1950 the largest four firms in the surety field have shown little turnover among their membership. Canadian Surety was in the top four firms for most years, for example.

This data shows that the surety business is moderately involved in contract construction in the aggregate. It is a moderately concentrated industry facing very unconcentrated buyers of its product. However, with at least 80 firms in the bonding business collusive denial of access to this important financial resource should not prove to be any problem of major significance in inhibiting construction firms. This last point has been supported

by industry spokesmen who suggest that if a firm really needs a bond someone will supply it. Thus the potential for bonding to act as an entry barrier to construction is not experienced from the supplier's side of the bonding market.

Claims experience on surety business is quite variable, both from firm to firm and from year to year.[16] For example, in 1970 the ratio of claims/premiums among the firms ranged from a low of 0.4 per cent to a high of 246.9 per cent. The all-company average changed from 16.5 per cent in 1969 to 38.3 per cent in 1970. What this variation would seem to indicate is that these firms are not as accurate at guaging the actual risk pattern as one might expect, and this error works in both directions. If they were very accurate the premiums, which react to construction volume, would also react due to changes in risk leaving loss ratios relatively stable. An American study for the period 1911 to 1947 showed that loss ratios on construction bonds fluctuated widely, and that this basically was in the opposite direction to construction activity.[17] A review of the Canadian data from 1954 to 1971 showed that the all year mean for the loss ratio was 14.79 per cent claims to premiums with a standard deviation of this mean of 13.60, nearly

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[16] This is an experience pattern that goes back in time and is accepted as a "normal" thing. See Backman, op. cit., pp.45-6, 172, and Report of the Superintendant of Insurance, op. cit.

[17] Backman, op. cit., pp. 239-69.

equal to that mean value. The value reached a maximum of 56.76 in 1956 and a low of 10.84 in 1968. (This is a figure which uses "net claims" after recovery and therefore a negative value can result). In view of these data the surety business does not appear to be a serious loss proposition nor a tremendously accurate guage of the real risk in the industry, although both of these conclusions are only indicated by the inadequate data base and are not proven by it.

Some statistical tests were applied to the data. When the "net claims" were regressed against construction expenditures the relationship was found to be statistically significant but a change in construction of $1 million was only associated with $460 of extra net claims, not a high degree of responsiveness in a practical sense. From this we can say the net claims are not crucially related to construction expenditure levels. This is partly explained by the use of "net" data so is not a reliable result for firm policy oriented conclusions, but until better data is made available it is all we have. The implication of this is that we cannot identify changes in net claims with the construction cycle.

An examination of premiums as related to construction expenditures did not show a linear relationship. (The Durbin-Watson values were very low). Since the total values of premiums reflect the changes in both the number of bonds issued and the premium rates they do not reflect accurately the full effect of cycles.

Numerical data on the pattern of premium rates as they are influenced by the construction cycle have not been made available but the industry reported to us that "...over a period of many years, Contract Bond rates have undergone little change and the cyclical changes in the construction industry have not been reflected in such rates".[18] Their explanation is that the rates do not adjust for expected losses because suretyship does not anticipate losses in the same way as insurance. In the long run of course sureties must cover expenses to survive, and it is that period, one of a decade or so, that they consider the relevant one. Additionally, some suggest that the risks are not homogeneous enough to justify statistical analysis.[19] Granting these arguements as having stood the test of time in the context of the goals of the surety industry, one could enquire about their significance for that industry. However, this study is more concerned with any impact on the construction industry and we must turn our interests in that direction.

The Effect of Bonds

There are several roles played by surety bonds in the construction industry of interest ot this study. They are the impact on risk allocation, and risk levels, the impact on entry barriers and structural elements of the industry, and the impact on efficiency and performance.

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[18] Correspondence with author by representative of the Surety Committee of the Insurance Bureau of Canada.

[19] Backman, op. cit., pp. 281-2, 331, 356, and 380.

Risk Alteration

Risk avoidance is a legitimate activity in the economy. In a market where most buyers are only intermittent purchasers and their purchases are major ones for long term capital purposes, the chances of loss become most important. This risk will be amplified when there is a higher degree of expectation of problems, as there must be with complex projects, and complex legal, technical and commercial arrangements. The use of surety bonds enables the buyer to reduce his risk of loss arising from failure on the part of a contractor who it must be recalled, is selling future performance rather than an existing product. Purchase and sale of construction services come in advance of performance, and this is itself a main source of risk. Thus, surety bonds in construction reduce risk, to the purchaser, of not getting his purchase under the contract terms, in particular the price. In the case of labour and material payment bonds, the risk to the supplier of having his trade credit go unpaid is reduced.

The contractor's default can be costly to the buyer in two ways. First is the cost of delay arising from any default since the delay keeps capital tied up in an unproductive unit. Bonds do not cover this cost. Secondly is the cost of reorganizing a new construction team which often results in a higher final product price. All, or most, of this risk is shifted from the buyer back

to the surety firm, and through it to the contractor. While there will be some degree of risk reduction arising from these bonds, the most important effect is the risk transfer. The resultant saving of this cost for the buyer could influence his decision to purchase construction services. Also, surety bonds may make some buyers feel they have a better chance of delivery from a bonded firm and their buying decision is altered. However, these effects are really immeasurable and would be minimal in the context of the many other variables affecting buying decisions. The variation in these risks over the cycle is hard to evaluate, but they are unlikely factors altering buying in cyclical patterns.

The shift of the risk of non-payment for labour and material means that the buyer receives his building project free of mechanics' liens. This clear title is desirable but can easily be achieved by other means in the contract negotiations. Even under mechanics' lien law the payment of the bills frees the title of such encumberances. Therefore the actual buying decision is not likely to be materially affected, and this includes cyclical dimensions, by the non-existence of surety bonds. They are a valuable service, but not crucial to total purchasing patterns.

Surety Bonds and Entry Barriers

The surety industry exists because some buyers do not want to bear all of the risks of having a builder fail to complete the contract to build or to pay suppliers. The inability to be

bonded clearly acts as a barrier to entry but only to those particular jobs where bonding is required by the buyers, which is certainly not all construction activity. It is a barrier of the absolute cost type. Its size depends on the cost of changing the unbondable firm into one with those particular characteristics satisfactory to a bonding company. Since these basic traits are several and complex some firms will be only marginally rejected while others are significantly below minimum standards. Additionally, the bond itself has specific conditions and limits. Typically a firm may be bonded only for certain types of work with the upper limit of the aggregate value of business also specified. Thus the size of the barrier is never a generally determinable amount but varies from firm to firm and from one subsector of the market to another.

Prior to issuing a bond the surety firm reviews and analyzes the firm quite extensively. Enquiry is made into such matters as personal and business reputations of management, technical capacities of estimators and supervisors, the type of business and the specific contracts involved, financial experience and backup reserves, etc.[20/] The review is equivalent to a credit analysis and is usually done quite separately from that other activity by financial institutions. In this way bonding acts as a kind of "quality control" over firms carried out by an independent examiner with a direct financial interest

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[20/] See Cox, op. cit., and Backman, op. cit.

in making sound judgments. Firms that are unable to obtain bonding would be in precarious standing for one or more relevant reasons. However, since about 35 per cent of construction requires bonding it is a barrier to only a portion of the final market, albeit an important portion which contains many public projects and large size projects.

Bonding has some impact on other structural features of the industry. The bonds are available to add business stability to all sizes of firm in all lines of the industry. One important criterion is the particular firm's ability to handle the specific contract. (And we must recall that the bond applies to a particular firm and a particular contract). As long as the firm's capability to fit into its niche of the market exists it can get bonding support. The status as contractor and subcontractor is not important. Therefore bonding acts to stabilize the patterns of concentration and vertical integration. Excessive expansion, in any direction is inhibited. Although the strength of the effect is quite weak, bonding is not totally neutral in its structural impact.

General Performance Effects

Some observors claim that bonding reduces the barriers to expansion once a firm has overcome the initial entry barrier. This arises for several reasons. One alleged reason is that a firm, after having been bonded, need not keep contingent reserves of its own tied up unproductively. Another claim is that a bigger portion

of the total market is opened up and expansion encouraged. But, in response, contingent reserves are not a strong feature of the construction industry anyway, and, expansion in any market depends on being in the market and on obtaining sales contracts. These alleged benefits are not estimated to be extensive, although they clearly do have some claim to validity.

In addition to being a barrier, however, the status of being bonded adds to the level of market information about the quality of the firms. Bonding is one indication of greater capacity to fulfill the contract, and such information always assists markets to function effectively. Some buyers choose to use this data but not all.

In so far as bonding encourages firms to be chosen that are more likely to perform it contributes to efficiency by reducing those delays due to business failure. This effect also arises indirectly due to bonding, that is indirect of the actual existence of the promise to pay. Bonding firms have an interest in reducing their losses and so when information comes to them of pending failures they often enter the project with extra help, both financial and technical, to keep the firm alive and the project continuing. This activity also reduces the delays due to failure and thus promotes efficiency in the construction industry.

Certain groups seek to promote wider use of bonding,

using the argument that it tends to keep out the "marginal" firms. But "quality control" is a two-edged sword, all too often used as a rationalization to justify restriction of other wise meritorious competition. If we know the differences in performance indicators for bonded firms compared to others, using such comparisons as the proportions of bankruptcies, quality of output, etc., we could judge the merits of such arguments and propose a policy, but real and relevant data is just not available. The proposals directed to adopting the bonding industry as the private issuer of licences to operate in the construction industry need real substantiation. That is, the general and real benefits need to be proven. Currently it is an optional screening mechanism used at the buyer's discretion. If the free enterprise system it to be maintained in this industry's milieu then such proposals ought to be rejected.

Conclusion

In conclusion, bonding is real source of risk-reduction and reallocation for the construction industry. As such it helps buyers and sellers in their market interactions. Measurement of the price and other effects of its impact is nearly impossible. Bonding restricts entry, but only by excluding the very "poor quality" firms (as defined with regard to each specific portion of the whole market) and since there are many bonded firms remaining to compete with bids, we could expect a negligible effect on prices due to restrained competition. It has not been possible to test

this quantitatively either. The bonding industry provides useful risk reduction and information to those who seek it and in this way allows the market to function more efficiently. No real impact on the cycle was found. The only policy conclusion that seems to evolve from this is that all calls for generalized compulsory bonding as a device to licence construction firms be rejected as an unsuitable task for the surety industry because it is not well suited to handling it in its current structure.

5.3b Mechanics' Lien Acts

The risk of not collecting payment for work done or materials supplied in the construction and repair industry has been around for a very long time. In response to these bad debt problems special statutes were passed, the first in Canada as early as 1873, to improve the chance of debt collection. These statutes, under provincial jurisdiction, are know as the Mechanics' Lien Acts. The underlying philosophy behind these laws is to put any asset that has been created or repaired by the application of labour and materials as security for payment for such labour and materials. It is not intended to be a

supervisory law for all dimensions of the construction industry.[21] Because of its prominent role in the industry it will be necessary to discuss it as a legal tool, to consider its main economic effects, and to propose some evaluation of it.

Legal Elements

Since the Mechanics' Lien Acts are provincial statutes there are ten in Canada, each having similar principles but specific and different detailed provisions. Generally liens attach to the property when work begins or materials begin to be applied. Most public works are excluded. Provisions for registration apply to help establish priority and awareness. (In Quebec law use "priviledges"). Liens against a property have priority over ordinary creditors in the case of insolvency. They do not allow any right of possession or sale, rather they are only encumbrances against the property. The enforcement procedure is through the courts. Thus, by use of a variety of appropriate legal mechanisms, a person providing labour or material to a construction project has a special status designed to reduce his risk from what it would otherwise be.

Holdbacks

In addition to assigning a special status to a claimant for work done or materials supplied, the statutes call for a compulsory retention of a certain portion of money due between buyer and contractor, and contractor and subsequent subcontractor in the chain. The result

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[21] Report of the Ontario Law Reform Commission, The Mechanics' Lien Act, February 22, 1966, p. 4.

is a safety fund that is available to pay lienholders' claims if default arises. The rate is usually 15 per cent of the payments due, but there are variations among provincial jurisdictions and by the value of the project.[22] The funds must be kept for a specified period of time varying from province to province. Most are between 30 and 40 days, a time sufficient for default to materialize. Legally this money may be classed as a trust fund with severe penalties for improper use, or they may be available for all uses by the recipient, depending on the particular jurisdiction. Greater restrictions on the use of such funds reduces the risk for the lienholder. Some jurisdictions make funds payable by a mortgagor to an owner subject to such restrictions also. It should be kept in mind that these holdbacks under the Mechanics' Lien Acts are quite distinct from the contractual holdbacks that a buyer may use as a guarantee of contract performance. Funds kept under the statute must be paid after the required period expires.

Evaluation

It is not appropriate here to evaluate the myriad details of interprovincial or intertemporal shifts in the law of mechanics' liens. However, the general effects and implications can be noted. They will be found in the following directions: (1) greater security for claims and the subsequent reduction in risk premiums, (2) with

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[22] For example Manitoba now requires a 20 percent holdback on contracts up to $15,000 in value but only 15 per cent on larger contracts.

lesser risk there should be fewer defaults or business failures, but (3) financing cash flow can become a problem of working capital management.

The measurement of risk premiums is itself a risky task. In some markets it may be fairly easy to get good indicators, e.g., interest rate differentials among borrowers, but in the construction industry so many other factors enter into the determination of prices that separation of risk premiums as they relate to mechanics' lien statutes is practically impossible on a cross section basis. Historically there have only been marginal changes in the law so intertemporal comparisons cannot be made. However, the conceptual fact remains--with lower risk it is reasonable to expect lower risk premiums built into the price of the final product.

The question of stability, especially cyclical instability, is likewise nearly impossible to estimate numerically. First one would want to know the number of business failures that did not arise because of the smaller bad debts loss accounted for by the security built up through mechanics' liens. Then one would need to relate this effect to agregate stability. It is conceptually reasonable to say that whatever the difficulty of measuring the first phenomenon, that it would be positive in value. The second point is, as yet, even conceptually unclear, but, as in the case of surety bonds, the expectation is that mechanics' liens would have negligible effect on the construction cycle.

The effect of liens on working capital has often been noted by industry spokesmen. If this capital is borrowed, as it often is, then cyclical effects will arise. The total effect should be measured by estimating the costs of financing the 15 per cent holdback for the required period. The aggregate value is not enough to affect construction decisions and their cyclical pattern. This means that there is no contracyclical policy potential in Mechanics' Lien law.

In sum then, it is quite reasonable to say, of the Mechanics' Lien Acts as of many other laws that compose the total fabric of commercial law, that the effects are immeasurable and marginal but clearly positive. The main supporting argument seems to be that their total absence would lead one to expect clear negative effects. Thus there is no impact on the construction cycle as a phenomenon and there is no policy potential for this purpose.

5.3c Other Risks

This industry faces the normal business risks and we have seen how two specific sets of legal provisions have been set up to assist, for the most part, this specific industry (although bonding in general is an ancient commercial practice going back past the Phoenicians). It can rely on the many other ways to reduce other risks that apply in general such as insurance, audits, security guards, etc. What other risk might distinguish this industry?

The only answer that comes up is the risk related to the relatively large size of each contract to each company's total activity. Usually business comes in what economists call lumpy increments. This tends to apply to all levels of size of firm.

There are fewer individual sales than in the typical mass market industries and so each particular sale means a lot to each firm. But this is not unique to construction. It holds in cases like large electrical generating equipment, shipbuilding and aircraft manufacture. These industries differ however in several ways such as their international character, their ability to use a single plant from which to ship their goods, the small number of buyers, and the small number of competitors. And, when needed these other industries buy-out, that is use contracts for inputs rather than take on the staff themselves. Construction is further along a continuing spectrum of industrial organizations. The specific risk of few sales, lumpiness in the firm's demand, is met by more careful selection of contracts and preparation of bids, and by keeping the share of fixed costs low. The contract system involves all three of these features. Therefore, my answer to the question of handling these other risks is the flexible contract system of organizing the industry's resources.

5.4 Conclusion

The industry faces a pattern of risk that tends to be related to a host of influences only one of which is the construction cycle. The downturns probably amplify the levels of certain components of this risk but it does not follow that changes in the cyclical pattern will cause reductions in the risks inherent in the way business is carried on in the industry. The benefits of stability in this area would be small and arise largely by making the commercial

environment a little less rigorous. These benefits would accrue to the entrepreneurs almost entirely, which is of course quite fair enough, but major gains in social efficiency resulting from changed business practices or risk would be minimal. As appeared throughout the briefs submitted to the Reference, the industry sees itself with problems but very few of them are predominantly caused by the cycle. Construction is a tough business requireing competent, alert management even in the best of times.

CHAPTER 6

POLICY DIRECTIONS AND CONCLUSIONS

6.1 Main Directions

The policy implications from this research work are not very extensive, at least not in the sense of providing support for a series of important or strong positive recommendations. The results do lead however to some recommendations about what not to do with the industrial organization dimensions of the construction industry for purposes of cyclical modification policy.

The main policy questions noted in the earlier section can be summed up as follows. Does the basic structure of the construction industry cause the construction cycle? To what degree? How? Other questions relate to the opposite direction of influence. Does the cycle influence the structure of the construction industry? To what extent? In what way? And of course, by what operating mechanism?

Tentative answers to these questions have been presented by the industry in its briefs to the Economic Council.[1] Often the thrust of the brief's positions was that such things as easy entry and "fragmentation" were amplifying the cycle. What this really meant was that there was a high degree of competition and in cyclical downturns the profit rate reacted to this competition. However, the original position was an expression of a meaningful hypothesis which has been found unsupported. Chapter 3 explained the set of reasons which

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[1] A summary of the positions will appear in the Report of the Reference on Construction Instability, forthcoming.

combine together to make the contract system the efficient way to muster the resources in this industry to meet the particular patterns of demand. These structural features were found to be neutral to the cycle, that is the structure was not affected by the cycle and, more importantly, that the structure could not permit the actual construction industry to modify the cycle. Suppliers clearly do not create their own demand and it would only be if the construction industry could modify that pattern of demand flow that it could alter the cycle.

Therefore, it is recommended that no policy measures designed to alter the structure of the construction industry be carried out with the expectation that they will modify the cycle. Other reasons may justify changes but certainly not cyclical stabilization.

6.2 Modification of Cyclical Impact on the Industry

The other side of this study has been to consider the impact of the cycle on the industry's structure and performance. Two major concerns of the industry are profits and failure rates. Here we must inevitably move to some value judgments about the role of competition and profit rates in the aggregate economic context. I agree with the Economic Council when it said that an efficient and flexible economic structure based on competition was the most appropriate way for most sectors of the economy to be operated.[2/] This

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[2/] Economic Council of Canada, Interim Report on Competition Policy, Queen's Printer, Ottawa, 1969, pp. 5-27, especially pp. 5-9.

inevitably means that fluctuation in profit rates is a very acceptable phenomenon and that observations of such shifts, as we have identified,[3] are indicators of competition operating to promote aggregate efficiency in resource allocation. Of course I do not say that as a stockholder seeking returns, but that is not my role. I would, as an economist, be only interested in fluctuating profit rates if it produced something beyond the distributional aspects. (The case where these distributional results contrasted with other social goals is discussed shortly.) If the results are correct that the cycle is unaltered by the structural form of the industry then I have no justification to propose to modify the cycle because of its effects on profit rate irregularity, or, to modify the structure (and probably profit rates) in order to modify the cycle. It is, in my view, a superb case for "laissez faire" to operate (as related to the cycle).

The second item of concern, failure rates, is a subsidiary problem to profits because negative profits produce failures. Here too, as an owner who suffers a failure I would be quite legitimately upset, but, as the Economic Council says, the use of competition as a device to organize industries and economies means "...that no individual competitor, corporate or otherwise, has an inherent right to stay in business".[4] Low profits

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[3] See details in companion study by M. R. Prentis, and Report of the Reference on Construction Instability, forthcoming.

[4] Interim Report on Competition Policy, op. cit., p. 20.

indicate a misallocation of resources in some way. If an industry is declining, even cyclically, the change will reduce profits and act as the primary economic indicator that too many resources are in the industry. If those losses occur during growth then they act to indicate that one set of resources is being misallocated within an industry, usually by incompetent management. Chapter 4 has discussed the real loss to the economy of bankruptcies. It is minimal, amounting only to a delay, and almost never to a cessation of completion of the project or to a full withdrawal of real resources from the system.[5] It is clear that I tolerate the inevitable dislocations of readjustment in an industry the same way we accept that portion of labour unemployment due to job switching, the frictional source. The experience of failure here was not out of line with other industries and special concessions to this one industry cannot be supported[6]

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[5] By using a seventeen year average of the number of construction bankruptcies, and assuming each one represents a one month delay on an average project worth $500,000, costing 8 per cent interest, I have calculated the annual loss in 1972 to be only $1.6 million. This is real loss, but in the context of a $16.5 billion industry, and losses due to other sources of delay (strikes, inadequate supplies), it is not significant.

[6] There have been suggestions that the losers here be compensated in an analagous manner to unemployment insurance. But debts are not always covered and the losses can have major impact on creditors, especially if they are unpaid workers, but this set of issues is independent of the business cycle. It could be a compensation scheme worth examining on its own merits however.

by reference to sizeable, real, social savings that could be made. One of the most outstanding experts in the field has put it in this context, "To diminish competitive pressures for the sake of preventing business losses and bankruptcies would be reasonable only if we were prepared to provide other devices designed to check improvident expansion, to eliminate the incompetent, and to wipe out overstated values. This would entail public control of the right to do business and perhaps of the character of the performance of business. Thus the proposal to protect business enterprise against bankruptcy is logically part of a proposal to substitute sweeping controls for competition."[7/]

In summary then, it is recommended that the fluctuations in profits and failure rates not be considered as important contributing justification for any policies to modify the construction cycle. These two phenomena are a normal, inherent part of the response in a dynamic, competitive, and efficient economy where profits represent a residual after other claimants are paid.

6.3 The Excessive Competition Question

In spite of the foregoing stance there is another legitimate matter to consider. Evidence presented in Chapter 4 gave an indication that the distribution of profits in this industry leaves a significant number of individual enterprises, specifically the typical small business proprietor,

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7/ Corwin D. Edwards, Maintaining Competition, Requisites of a Governmental Policy, McGraw-Hill, New York, 1949, and revised 1964, pp. 13, 23,

earning a very low relative income. This subject is one where concern is legitimate even in the context of a laissez faire policy orientation.

Industries, or parts of industries, with easy entry, chronic low levels of profit and high and inflexible markups have been called "sick industries". Often they have excess capacity which means that there is idle capacity. In construction this usually shows up as underemployment or disguised unemployment. It is only a partial section of the construction industry, clearly not all of it, that has these characteristics, as Chapter 4 indicated.[8] What policy is advisable here in what Milton Moore has called the "easy entry oligopolies"?[9]

The Economic Council acknowledged this class of competitors as a source of special problems in its comprehensive review of competition policy.[10] Its proposal was

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[8] Chapter 4 discussed the profit markup differentials by size of firm for the mechanical, electrical, and highway contractors.

[9] Milton Moore, How Much Price Competition, The Prerequisites of an Effective Canadian Competition Policy, McGill-Queen's University Press, Montreal, 1970, pp. 22-27. The oligopoly status is applied because where each market is local there are only a few competitors really in a position to sell. Monopolistic competition is also used as the description of some markets here.

[10] Interim Report on Competition Policy, op. cit., pp. 166-167.

a case by case policy in which the possibility of controlling entry by licensing should be restricted to the cases in which the objectives are clear, not inconsistent with final consumer welfare, and subject to public scrutiny periodically.[11]

What reasons might justify controlled entry? Safety is clearly one and we already prevent unqualified persons from installing such things as electricals in this category of restriction. Public health is another case. Both of these are now taken into account with skill certification and building inspection.

Before specifying other justifications we must make it clear that we are concerned here with the proprietorships with sales of less than about $50,000 gross per year. These are mainly the household repairmen and rennovators. Their numbers may reach as much as 40,000 however.[12]

General discussion of this problem in other cases has produced several other justifications.[13] One is to promote the welfare of a "basic" group such as the farmer. Another is to promote small business, specifically those firms now operating small. Or, the goal is final product quality control. Whatever these rationalizations the basic

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[11] Ibid., and C. D. Edwards, op. cit., p. 14.

[12] See supra, Section 4.5.

[13] For one discussion of this wide area see Clair Wilcox, Public Policies Towards Business, R. D. Irwin, Homewood, Illinois, 1960 (revised), pp. 341-538.

intention is to share the available work less widely so that each firm's profits will rise. Restrictions use some form of regulation or licensing. Sometimes it is based on geographical aspects (a city or province); sometimes it is based on occupational groups (plumbers, barbers, etc.). Such policies have seldom proved to be a panacea or uncontroversial.[14] Often the regulators or the licensing body loses sight of the consumer interest in prices, service and efficiency. Allocation of the licences creates its own problems, especially when their prices rise on the open market to such levels that the original state of low net earnings returns. What then can be done?

If one believes that there is a problem with excessive competition, that this problem is the sick industry syndrome, that a solution is desirable to this set of problems, then the policy proposal of Professor Milton Moore has appeal.[15] His idea is to create a barrier to entry of the type that this market does not. It can best be done with an absolute capital cost barrier. That is, entry to the licensed group would be dependent upon having a specific sum of capital, say $10,000. This sum would be held, not as a deposit against other creditors (except after failure of the business) but simply to provide a capital (capitalistic) barrier to those firms the market deemed unworthy of supporting. Moore would permit interest to accrue on this sum. The effect is to create an absolute cost barrier because the market does not.

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[14] For one brief review of the experience see C. D. Edwards, op. cit., pp. 204-214.

[15] Milton Moore, op. cit., pp. 190-191.

The idea has merit, but it does not stand perfect. Since the deposit would be considered available to cover creditors it might not be too effective. More importantly, however, it would cause a major restructuring of the business activities of up to half the "firms" in the industry. To continue in construction many, even most, of these would have to move from their free enterprise, entrepreneurial status to that of employee. That move would not guarantee them employment stability but their chance to go out on their own while unemployed would be severely curtailed. The decision to institute such a scheme would need further economic analysis and probably political courage.

As a result of this review of this area of concern, I would recommend a further evaluation of how the particular sector of the construction industry to be affected would respond to such a scheme. If it was favourable then further research on its implementation could be carried out bearing carefully in mind that the effect on prices must be put into the calculation.

6.4 Final Note

This industry is a very large and important one in the Canadian economy. Its structure is complex and effervescent. Inevitably there are problems which press upon its members in various ways with several degrees of impact. Demand characteristics dominate as influences, especially its complexity and specificity. The cycle has impact but not in a degree sufficient to affect the aggregate structural variables. Suppliers arrange their mutual

interactions and their dealings with buyers in ways that enable flexibility and effectiveness. It is really an efficient total supply structure in the context of the demand characteristics and the technological constraints. Real problems exist but in most cases they are at the micro level where aggregate phenomena such as the cycle have only peripheral influence.

In a policy sense these conclusions lead to a generally laissez-faire orientation in terms of the cycle. The individual cases can be managed only in that context where the specific cases or sets of cases can be seen as such. Too often industry spokesmen have blamed the aggregate situation, because it is quite visible and has some common sense appeal, as a demon. Too seldom have observers sought the difficult to accept reality that in spite of the cycle it is internal organizational problems that are the real source of problems to the industry. Too often have observers tried to homogenize the construction industry and thereby obscure the individual problems. Too often have real normal problems of an industry been blamed on aggregate phenomenon related to the flow of output. Too often solutions have been proposed that have, upon close analysis, negligible relationship to the solution of those real pressing problems of the industry's entrepreneurs. And finally, the full links to society's legitimate interactions with these entrepreneurs have gone misunderstood by most observers. Hopefully this study contributes to the total Reference; hopefully the whole Reference contributes to the mutual understandings by adding new knowledge, collections of existing knowledge, and new insights into ways of seeing construction and the construction industry.

APPENDIX A.1

PROPOSED DATA IMPROVEMENTS

The subject of proposed data improvements for industrial organization studies of construction requires that an outline of the ideal data that one might hope for be compared with what is available. That is, we can specify the questions that would be of interest. The general theme of this Appendix is that the data was very poor in the past but that the Census of Contractors now rapidly evolving is heading in the right direction with the proper type of questions behind the data base.

It should go without saying that the data ought to be collected with properly designed questionnaires, with a properly designed sample or a true census, and with adequate processing that does not destroy the basic data bank after the publication of the regular annual reports. Unfortunately these desirable conditions did not exist in the past, but I have been assured by the officials of Statistics Canada that improvements are now operational for the future.

Concentration Data

Concentration data is the most elementary data used for industrial organization studies. It should be applicable to appropriate subsidiary parts of the whole industry, the sub-industries noted earlier. The current breakdown in the data on Mechanical Contractors illustrates this procedure well.[1/] Also it should be available on the

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[1/] See Statistics Canada, The Mechanical Contracting Industry, Bulletin 64-204, 1970.

basis of other classification criteria, including a minimum: regional or provincial breakdowns, even for major urban areas, legal entity, specialization by type of work, and type of construction, and profit or loss status. These are now being done and thus the data base in the Industry Census is considered good. The size criterion, currently sales by own labour force to represent value added, is acceptable but not exclusively. Data reclassification according to other size indicators should be kept available, for example by gross billings, assets and labour force. This too is available from special tabulations and from these differences between measures can be identified. While these could be small we do not yet know of them and their trends. And, the upper size category should be carefully watched so it does not become unsuitable as it did in the past.

Market coverage data would be helpful to identify the extent to which markets are local, regional, or national. Intraprovincial breakdowns of contract revenues would be a helpful set of information. It would go into the analysis of the concentration data for purposes of proper interpretation.

Operational Data

Operational data now being collected with the Industry Census is quite extensive. It does permit profit rates on sales to be calculated but not profit rates on equity or assets, both of which are useful bases and should

be employed in any full analysis of the industry. The relevant data for analysis of the degree of subcontracting, the role of materials, and the fixed: variable cost ratios is available and should continue to be collected. As additional data of interest I would suggest that the number of separate contracts and selected balance sheet items could be usefully included for the whole industry as is now done for the Electrical Contractors.[2/]

Therefore, it seems that the data base collected under the auspices of the new Industry Census is adequate in scope and detail to analyze the main structural features of concentration and operating characteristics of the firms. Many cross tabulations are published and others are available where needed. But, this is a new situation, not yet completely developed, and the shortage of time series data precluded proper cyclical analysis.

Other Structural Data

There are other structural features that can be analyzed with data of course. First is the entry, exit, and change of size situation. Each of these phenomena is important in the construction industry. Separate tabulations of new entrants by size and other criteria can be made from the current data base. This should be done. The special case of foreign firms entering should be considered in case they are excluded from the Census for any reason.

[2/] Statistics Canada, The Electrical Contracting Industry, Bulletin 64-205, 1970.

Exits could also be done on a similar basis as entries. The change of size situation is also an interesting and important feature of this industry's structure. It was counted earlier and ought to be revived. (See discussion in Chapter 4.) The age distribution of firms, as done for the highway contractors is a valuable piece of structural data.[3/] Ownership nationality can also be identified. Mergers should also be tallied with sub-categories for industry taking (and taken) over and the nationality of owners (old and new). These elements of internal flux are quite significant in construction and ought to be monitored in the data collection process. After a few years have been accumulated the interesting cyclical questions can be analyzed numerically.

The question of the contract system which absorbed so much attention of Chapter 3 of this study is a difficult one to handle in a numerical sense. I have already suggested that the number of contracts per firm be tallied but this would not necessarily tell us that the contract system was changing because the demand structure always has various sizes of projects and mixes of needed skills. Data on the number of contractors in selected projects can be collected but again this also varies with the nature of the contract. Changes in the number of contracts year to year would not be of much interest, although in the long run change would be a partial indicator. We might be able to identify changes

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[3/] Statistics Canada, The Highway, Road, Street and Bridge Contracting Industry, Bulletin 64-206, 1970.

if it became more difficult to classify contractors by type of specialization. The only single numerical indicator that is easily collectible that could identify the basic structure is the role of "own account" construction in the total, but it is far from suitable for the more subtle changes involved in more permanent vertical integration. The merger data would be most useful to this purpose because it is, after all, the vertical structure that is the essence of the contract system.

The small proprietor data used in this study is that from the tax data base. It does not integrate well with the corporate data. If the new Census were restricted to corporate firms only it would be in order to suggest that this base be integrated, but this is no longer particularly necessary for industrial study purposes.

Another problem is the groups excluded from the Industry Census. While the rigid criterion of major sources of income is valuable it can exclude certain groups especially when the residential construction industry is considered. Consistency that omits major builders should not allow for inadequate pictures to be presented.

Summary

As a result of this study several interesting structural features of the industry have come to light. The data for cross sectional studies is basically very good, what there is of it. Time series has been impossible

because the data extends back only to 1970 in reliable form. However, the situation in the future will be much better now that a properly designed Census is developing. That Census has some important gaps such as residential construction, but they should soon be filled with comprehensive and reliable data needing only marginal adjustments. The main structural features have been identified and data to expose numerical and more qualitative dimensions is here or pending. This is all too late for cyclical analysis using numerical procedures at this time but if the next major industry study waits a decade some useful test can be made. Hopefully, they can support this study's contentions.

P.S. This Appendix makes no reference to the utility of the Census for other types of study such as labour market or productivity analysis. My colleagues are doing that in companion studies.

APPENDIX A.2

NOTES ON DOUBLE COUNTING IN CONSTRUCTION INDUSTRY STATISTICS

The several reports by Statistics Canada that provide information on industry structure (specifically The Electrical Contracting Industry, Bulletin 64-205; The Mechanical Contracting Industry, Bulletin 64-204; and The Highway, Road, Street and Bridge Contracting Industry, Bulletin 64-206) note explicitly in the "General Review" section of the document that double counting is present in their figures. It arises because firms that deal with each other on a contractor-subcontractor basis can both be classed into the same category, even the same size class. Effects of this situation can distort the evaluation of the sample size, the pattern of size classifications, and certain of the analytical conclusions. The following paragraphs explain the reasons for double counting, the types of effects, and the implications in more detail.

The Source of Double Counting

The standard arrangement among firms in a construction project is to use separate, specialized firms to do particular parts such as electrical work, mechanical work, etc. The typical payment procedure is to have the project purchaser pay the general contractor, who in turn pays the second level of subcontractor, who in turn pays his subcontractors in a hierarchical pattern. The payments represent "gross revenues" to each firm and are part of the

firm's report to Statistics Canada. If these gross revenues were added they would expand the total revenues above the value of the final product in some amount related to the number of tiers and the significance of the subcontractors' roles. It is a common type of problem to those familiar with national income accounts and arises because the groups deal with each other as buyers and sellers.

For the construction industry as a whole, double counting exists with strong effects because of the interrelationships among firms. It also appears in the subcategories because they too have specialized subgroups which interact by buying and selling with each other. Thus double counting arises in the data on each sector. If each sector was defined so that no member subcontracted to another member, the problem would be eliminated, but this would do more to proliferate categories than solve problems.

The Effects

The effects of double counting can show up in two main ways. Unless accounted for, overestimation of totals can arise. Also, there is an influence on the size categories when these breakdowns are used for analysis, and from this certain analytical values will be influenced.

First, the value of final product will not be the sum of total revenues of all reporting units in any sample and thus the sum of total revenues in the sample will not be useful to gauge the coverage ration and adequacy of the sample. In order to do that an adjustment

must be made to remove the doubly counted items, that is the payments to subcontractors. However, even this does not yield a totally correct figure for adjustment unless one can assume that all subcontractors' payments in any particular industrial sector are in fact payments for services by firms that are within the same industrial category because the payments to subcontractors are only double counted if the subcontractor is a member of the same industrial category, e.g. one electrical contractor to another. In practice, subcontracts can be either for activities within the same category or outside it. Unfortunately, the data collected do not allow us to measure how much of the subcontracting is done in either class, that is, to get a measure of the real double counting. Thus all we know is that some unknown quantity of double counting exists in our samples.

The second set of problems that may arise from double counting concerns the breakdown and analysis of firms by size, when sales or a derivative criterion is used. The forementioned effects of intragroup trade have to be adjusted for an extra factor, specifically the trade between and inside each size group. This second type of trade and thus the double counting may be a function of size. For example, larger (electrical) firms may subcontract their (electrical) business to smaller (electrical) firms. One might adopt a simplifying assumption that the role of intraindustry subcontracting, which means double counting, is independent of size of firm.

Potentially more important is the effect of the choice of allocation criteria for the size distribution of the firms. Statistics Canada publications array data by size groups using the criteria of "Total Revenues" net of "Payments to Subcontractors". This is a legitimate procedure, analogous to the use of "Value of Factory Shipments" in other manufacturing analysis. However, it can be legitimate to use Total Revenues without adjustment for double counting. The choice of criterion for allocation and the presence of double counting affect the size distributions, their range and the distribution within the size classes.

In the case of joint projects, which is what subcontracting really amounts to, both the practice of subcontracting and the criteria of allocation can affect the range of size classes. To illustrate, assume that the output of the electrical equipment in any particular time period is valued at $100. If installation is shared equally by two electrical subcontractors under a general contractor, who would be recorded in the General Contractor sector of the industry, then the two electrical firms report in as having $50 "Sales", and both are the same size with either criterion. But if one electrical contractor subcontracted half the project to another electrical contractor, then, with the use of Total Revenues as the criterion, the range of size groups would have to include the two firms and they would not be the same size.

The use of the other criteria, "Total Revenues Net of Payments to Subcontractors" would place the two according to the work value they actually do process, $50 in the example. The range of scale is smaller and the distribution within the classes is quite different in the second case. This second criteria, being analogous to the use of "Factory Shipments", is probably better, but it can create analytical difficulties, to be discussed next.

Significance for Analysis

What does it mean for analysis to have the values dependent upon data with double counting, and with data based on size classifications subject to major changes dependent upon both the legal manner of arranging the same business and the mannter of adjusting for double counting?

First, the existence of double counting means that the value of work reported by the sample could not be reconciled to that reported purchased by buyers.[1/] The former will probably be higher because there is double counting, but we do not know for sure just how much because we are not told how much of the subcontracting is done by firms to be classed in the same industry. The situation is not remediable without asking respondents to specify the sector in which all

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[1/] Even if the sample became a true Census, this cannot be estimated by comparison to buyer data because the classifications are not comparable. Buyer data (which appears in Construction in Canada, Bulletin 64-201) is recorded by type of use or user while seller data is recorded by class of work performed.

its subcontractors are allocated. Numerically the subcontracting ranges from very low levels to as much as 25 per cent for some size groups in some provinces. These values set upper limits to the double counting, but that is all we can be sure of from the data. Since the problem is not readily reduced we must live with it, and explicitly acknowledge it.

The data related to subcontracting, when broken down by size classes, creates other analytical problems. If the role of subcontractors in the same industrial group is the same for each size class then the ratio subcontracting costs/construction revenue (S/C) would indicate the capacity of the firms in each size class to do all of the tasks in the project. A higher ratio would tend to indicate greater specialization since larger portions of the task would be hired from another firm. A lower S/C ratio would mean less specialization. As an example, consider the contract for the electrical work in an office building. The general electrical contractor may subcontract the heavy transformer installation while doing the internal distribution itself. And, the construction of special conduits and such work not specifically electrical, may also be subcontracted. Because we do not know the ratio for these intragroup subcontracts, either in aggregate or by size group, we must be most cautious in interpretation of differences in specialization between large and small firms.

Secondly, this ratio of subcontracting costs/ construction revenue itself has a major impact on the size category in which a firm is positioned since, as was explained, the size criteria is construction revenue net of subcontracting costs. The more subcontracting a firm does the smaller size category it will belong in even if its gross revenues remain the same. Thus, those firms which do more subcontracting than average for their volume of gross revenues may find themselves into a lower size category, which in turn will bias upwards the ratio of subcontracting cost/construction revenue in that other group. It will only cause important bias in the results if there is a wide variation in the S/C ratio for firms doing the same gross revenue, but the potential is there. The result of any distortion is that we cannot get unbiased estimates of the true S/C ratio by size class. However, as often happens, we do not have an estimate of the size of the bias, but we do know the direction it will take. Caution in interpretation is therefore called for with an explicit caveat noted.

APPENDIX A.3

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