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## Project Finance Model for Small Contractors in USA

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### ABSTRACT

This research looks at the significance of barriers that firms considering entry into the construction industry might face. Drawing on the microeconomic characteristics of imperfectly competitive and oligopolistic markets the analysis finds that there are a dozen barriers to entry that affect the industry, but their significance depends on the product type. The discussion covers the question of product homogeneity in construction and evidence for the existence of barriers to entry in concentration levels. Barriers to entry specific to construction are then identified, which leads to an analysis of how they operate and their significance (high, medium or low) in different market types, thus increasing our understanding of construction industry dynamics.

Keywords: construction industry, barriers to entry, product homogeneity, product differentiation

### INTRODUCTION

The importance of industry structure is based on the way that structure determines both the intensity of competition and the competitive strategies of firms in an industry. This is based on the structure-conduct-performance (SCP) approach to industry analysis that originated in the US in the 1930s with the work of Mason (1939) and Bain (1959). Factors that SCP considers include the number and size of firms and type of product or products in a market and the extent of control firms have over prices. Related issues are the way the process of competition affects prices and profits, the ease of entry of new firms into an industry or frequency of exit of firms from an industry, the impact of demand shocks (i.e. the business cycle) and the effects of new technologies. To date there have been few applications of the SCP framework to construction, Fleming (1993) and Ive and Gruneberg (2000) are two examples.

The key factor in the dynamics of industry development over time is the effect of entry and exit to and from the industry. Entry into an industry is the process where firms decide to become participants, undertake the necessary

preparation and investment, and then compete with established market players. Exits are those

firms that decide to withdraw from the market due to lack of profits or prospects, get taken over or fail financially.

The difficulties faced by entrants, and potential entrants who might decide to enter at some point in the future, are known as barriers to entry and were first identified by Bain (1956). There are now a number of different approaches to this idea. Some are based on the mobility of resources (see Geroski et al. 1990), while Shepherd and Shepherd (2004: 192) list 13 external and nine internal sources of barriers. McAfee (2004) found seven distinct definitions of barriers to entry and divided them into those that are economic in nature and those that are 'antitrust' (the US name for competition policy). Some industries have high barriers to entry (automobiles, chemicals, supermarkets) some have low barriers to entry (restaurants, cleaning, many trades).

Although barriers to entry are clearly important there has to date been limited consideration of their role in the construction industry. Previous research by Ezulike et al. (1997), Gruneberg and Ive (2000), and de Valance (2003) showed that barriers do exist, and established that they play a role in the industry. However that research did not go on to specifically address two basic questions about barriers to entry in construction: how do they operate, and what is their significance to the industry. This research builds on that earlier work and addresses those questions.

The rest of the paper is structured as follows. The next section defines the four market types found in microeconomics and their main characteristics, including the height of the barriers to entry found in each type. This is followed by a discussion on the question of product homogeneity in construction. Evidence for the existence and significance of barriers to entry in construction is found in concentration levels in the industry. Barriers to entry specific to construction are then identified, followed by a discussion on how they operate, which leads to

an analysis of their significance (high, medium or low) in different market types. That analysis is the contribution this research makes to deepen our understanding of the construction industry.

### **MARKET TYPES AND BARRIERS TO ENTRY**

The microeconomic framework has four types of market, each one having a set of distinctive characteristics. For the purposes of this paper monopoly can be disregarded, but the three other market types of perfect competition, monopolistic competition and oligopoly are found in construction. Barriers to entry are one of the characteristics used when distinguishing between these different market types.

The characteristics of a perfectly competitive industry are many small firms with no control over price, producing the same (homogeneous) product under conditions of perfect information and no barriers to entry. This is held as the 'ideal' market and is the foundation on which neoclassical analysis was built. The other industry model found in neoclassical economics was monopoly, where a single firm is the only producer. Thus there were initially two extreme types of market, one full of competition and the other without any competition. Because many industries do not have these characteristics and fall between perfect competition and monopoly the models of monopolistic competition and oligopoly were developed. These market types are known as imperfectly competitive markets.

The 'monopolistic competition revolution' of the 1930s developed theories of imperfect competition based on the work of Chamberlin (1933) and Robinson (1933). Under monopolistic competition there are many small firms with limited control over price, producing either identical (homogeneous) or differentiated products supported by brand names and marketing with some (often important) barriers to entry. A renewed interest in monopolistic competition occurred in the 1980s after Dixit and Stiglitz (1977) developed a formalised model of imperfect competition incorporating product diversity and consumer choice.

The fourth market type is oligopoly. The key characteristics of an oligopoly are a few large (but not necessarily the same size) firms and significant barriers to entry (Bain 1956). The modern theory and definition of oligopolistic markets was developed in the 1950s (eg. Modigliani 1958) "as a result of two processes of economic change: the process of concentration (the market share of the largest four, six or eight firms) and the process of differentiation". Industries that became concentrated oligopolies produce homogenous product (steel, cement,

basic chemicals, electricity), while differentiated oligopolies are found in consumer goods markets (computers, automobiles, banking and insurance) (Sylos-Labini 1987: 701).

Although the significance of barriers to entry as one of the key factors in distinguishing between different market types has been recognised since Bain's (1956, 1959) pioneering research, there are different ideas on how barriers operate and a range of definitions used. McAfee et al. (2004) surveyed the history of the concept of barriers to entry and found seven "principle definitions of an entry barrier" including the two fundamental definitions: Bain's "advantage of established sellers in an industry" (1956) and Stigler's "cost borne by firms seeking to enter ... not borne by firms already in an industry (1968). McAfee et al. then introduced another four definitions as a new classification of entry barriers: economic barriers (cost based); antitrust barriers (a cost that delays entry); primary barriers (operate on their own); and ancillary barriers (reinforce others). As a consequence of this diversity, Carlton (2004) argued that disagreement over definitions can lead to problems when applying the concept of barriers to entry in competition policy (antitrust in the US) or regulatory determinations (as in decisions on mergers and acquisitions by the Australian Competition and Consumer Commission).

### **PRODUCT HOMOGENEITY**

Another approach to market structure is to base the distinction on product homogeneity (sameness) or heterogeneity (differentiation). Using this approach monopoly, homogeneous oligopoly and perfect competition are similar, with homogeneous products, and differentiated oligopoly and monopolistic competition are similar, with differentiated products (Scherer and Ross 1990: 17). The unit of analysis used by Scherer and Ross is the industry, not the market or the firm. This avoids the major problem found when trying to apply market models to particular industries. In the one-product perfect-competition market model the relationship between firms, industry and markets is relatively straightforward. Firms belonging to the same industry produce a single identical product, which they all sell in the same market. In this framework the industry and the market are identical because each has the same group of firms as producers. However, this identity does not exist where firms are large and produce a range of products, many of which are not close substitutes, and sell in more than one market.

In construction there are two views on this. On the one hand the industry produces buildings of many different types (residential, commercial, industrial etc.), on the other it manages the process of building. In answer to the question 'Can the standard concept of a homogeneous product be applied to construction?' Gruneberg and Ive suggest that "In construction, product markets can be seen as sets of projects, clients and producers" (2000: 106). Also, there are no "clear product markets" or "a tendency towards homogeneity within product markets or a single product market unit price" (Gruneberg and Ive 2000: 107). Runeson (2000) and other researchers answer to this is that the industry is the market for building management services, not for products called buildings (Hillbrandt (2000) has a similar view). The Gruneberg and Ive model is therefore distinctive, in that it sees construction output as a product rather than a service. Services are clearly homogeneous, while products can be differentiated. There is some agreement with Gruneberg and Ive from those who classify markets by statistical data collections based on building types (for example, Schutt 1995 and Briscoe 1988).

In this paper the approach taken uses the distinction between homogeneous and differentiated products based on the ability of contractors to specialise in specific markets or types of projects (see de Valence 2003). Ezulike et al. (1997) also found that significant barriers to entry existed for Private Finance Initiative (PFI) projects in Scotland and some large contractors were specialising in these projects.

### **CONCENTRATION IN CONSTRUCTION**

The construction industry is predominantly made up of small firms, so the typical analysis based on the number of firms and extent market power reveals a fragmented, diverse industry of small firms with low barriers to entry (Fleming 1988). This supports the view of the industry as being an industry with the characteristics of perfect competition (Runeson 2000). However, here is also evidence that the largest firms in the industry in many countries account for a significant share of industry turnover.

Studies on the market share of the largest contractors for different countries include

Australia (de Valence 2003), South Korea (Yoon and Kang 2003), Japan (Woddall 1996) and Hong Kong (Chiang et. al. 2001). These all found significant concentration at varying ratios, with the largest firms accounting for up to 70 per cent of industry turnover.

In one of the few studies that specifically addressed industry structure, McCloughan (2004) analysed trends in concentration in the British construction industry at three levels. First, aggregate concentration is low in the British construction industry with the largest 100 private contractors accounting for 20 per cent of activity and 15 per cent of employment. This share has been declining since 1971, when these values were 29 and 25 per cent respectively, with wide annual fluctuations. Second, the five-firm concentration ratio (C5) is estimated for what McCloughan (following the statistical categories) calls the 'main trades'. For 1998 these estimates are general builders at around 10 per cent, building and civil engineering contractors around 20 per cent and civil engineers 15 per cent. He concludes that "in the context of a national geographic market, the main construction trades are fragmented (i.e. low concentrated) markets" (2004: 986).

Third, McCloughan divided specialist trades into a labour-intensive, low capital, easy to enter category (including plumbers, plasterers, carpenters and painters that deals mainly with private customers), and a second group of more concentrated trades that work for commercial and government clients. The trades and C5 estimates in the concentrated category were: scaffolding specialists 56 per cent; asphalt and tar sprayers 40 per cent; constructional engineers 36 per cent; insulation specialists 39 per cent; and demolition specialists 31 per cent. McCloughan suggests that "If regional size distribution data become available, it is not unlikely that some or all such specialist trades ... would register as highly concentrated (C5>70%)" (2004: 987).

Recent data from the annual *Construction 100: Australia's 100 largest commercial contractors* compiled by HIA-Reed Construction Data (latest 2004-05) gives the market share of the top 10 and top 20 contractors, shown in Figure 1.

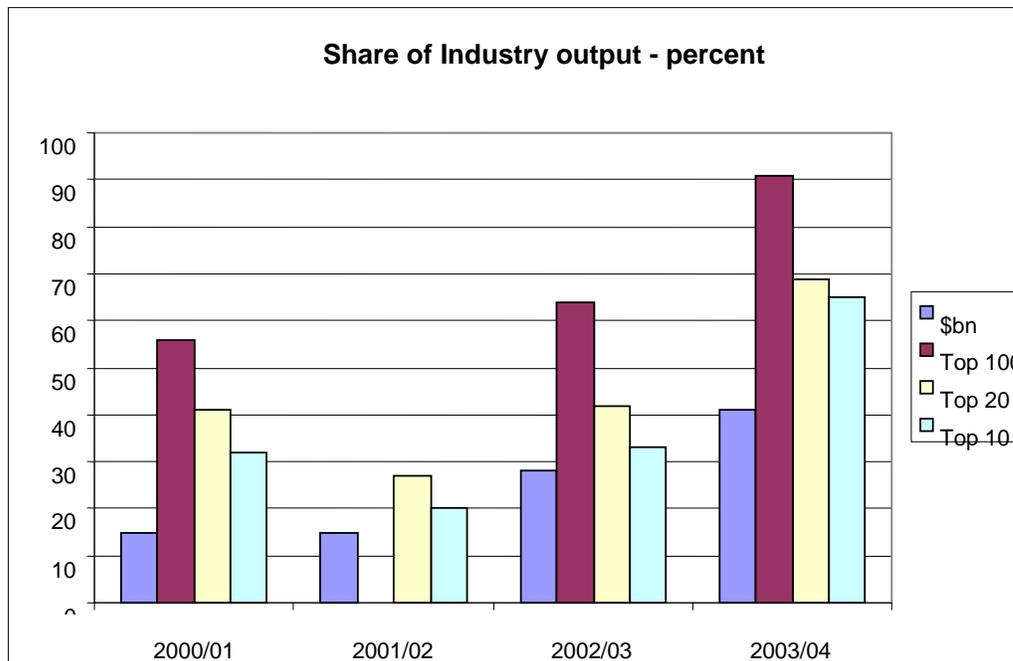


Figure 1. Australian Construction Industry Output and Turnover of Largest Firms

(Source: *Construction 100: Australia's 100 largest commercial contractors*, HIA-Reed Construction Data, various years).

Although the levels vary from year to year these firms typically account for 30 to 50 per cent or more of industry turnover. These figures support earlier data from the Australian Contractors Association (ACA), which represents the largest contractors. The 1997-98 *Annual Report* of the ACA gave total turnover of the then 18 members in as over \$15 billion, or over half total non-residential construction for that year, and employment of over 49,000 (ACA 1998). The 2001 *Annual Report* stated "members account for around 40% of total construction activity in Australia" (ACA 2001: 24).

If concentration levels like these are found in an industry there must be barriers to entry that help create and preserve them. What these barriers are and how they operate are covered in the next sections of the paper.

### **BARRIERS IN CONSTRUCTION**

Ezulike et al. (1997) study of contractors in the PFI market identified six barriers to entry: lack of appropriate skills; high participation costs; high project values; high risk; lack of credibility and contacts; and demands on management time. The most prominent barrier was incurred costs in bidding and fees paid to financial and legal consultants. Their findings suggested the larger

contractor were more able to overcome these barriers and compete in the PFI market, and this leads to a 'two-tier' market where smaller contractors are unable to compete. Although interesting, this study covered limited ground and it is hard to generalise the results, beyond saying that these barriers would apply to many or most large projects in some form and are not unique to PFI projects.

There were six barriers to entry identified by Gruneberg and Ive (2000: 97-101), one of which was unique to construction. The first five barriers to entry are economies of scale, supply chains, incumbent cost advantages, private information (including client relationships), and contestable markets (no sunk costs). These barriers are treated more or less conventionally, albeit with the emphasis on construction firms and markets. The unique barrier is "client imposed barriers to entry to contract construction markets", based on a view of contractor growth as a series of steps of increasing project size and complexity. If clients shortlist tenderers with experience on similar projects this becomes "one major limit on the growth rate of construction firms". Two ways around this barrier are identified: firstly, clients having different 'project size bands' allow contractors to take advantage of overlaps between them; secondly, for projects

requiring innovation past experience will not be so important and clients may consider firms "on the basis of the strength of their ideas or methods" (Gruneberg and Ive 2000: 100-01).

The six barriers specific to the construction industry discussed by de Valence (2003) were: the cost of investment necessary to become a participant, ranging from very low (the building industry) to very high (starting an airline, for example); the market power of incumbents; acquisition of the technology, skills and workforce needed; access to equity and debt finance; the state of the market, or the growth rate in and level of demand; and the intensity of competition and margins available. That study found:

When the building industry is assessed in terms of barriers to entry it is clear that there are two levels in operation. There are currently few significant barriers to entry to the building industry for small firms, and such barriers will continue to be low while the industry maintains current practices based on a large number of small, specialised subcontractors. There are, however, a limited number of contractors capable of managing large projects, and the barriers to entry at this level in the form of prequalification are significant, based on track record, financial capacity and technical capability (de Valence 2003: 5).

The conclusion was that specific sectors in the construction industry have the characteristics of an oligopoly. The oligopolistic characteristics of the large contractors in the industry have tended to be overlooked because of the numerical dominance of small firms, which typically operate under conditions of perfect competition. There are significant barriers to entry through client prequalification requirements for technical capability, track record and financial capacity in engineering construction and non-residential, and some specialist trades have few firms capable of taking on large projects. There are only three major manufacturers that supply lifts and building automation systems (BAS), and these are often done as supply and fit subcontracts by the manufacturers. Also, some of the materials and equipment suppliers are highly concentrated, and have been subject to actions by competition authorities in many countries.

Interestingly there is not much overlap between the two approaches cited here. Two of Gruneberg and Ive's barriers, incumbent cost advantages and private information (including client relationships), are collapsed into market power of incumbents by de Valence. Both thus agree on the importance of client procurement

processes, but discuss different other barriers. A combination of the two approaches gives a dozen significant barriers to entry operating in construction markets. How do these affect competition?

## **HOW BARRIERS OPERATE**

When the building industry is assessed in terms of barriers to entry it is clear that there are two levels in operation. There are currently few significant barriers to entry to the building industry for small firms, and such barriers will continue to be low while the industry maintains current practices based on a large number of small, specialised subcontractors. There is, however, a limited number of contractors capable of managing large projects, and the barriers to entry at this level in the form of prequalification are significant, based on track record, financial capacity and technical capability. Due to the risk characteristics of large projects a contractor has to have demonstrated the ability to manage and coordinate such works. Because there are only a few large contractors capable of undertaking major projects they tend to develop strong links with these clients, and these relationships are a significant barrier to entry to the types of projects carried out for such clients for other contractors. As prequalification becomes more rigorous and widespread in the industry, this is emerging as the most important barrier to entry.

Monopolistic competition is the market type the covers many of the medium-size firms in the construction industry. The more capital intensive subcontractors in trades like excavation and demolition and heating, ventilation and air conditioning (HVAC). The HVAC part of the industry in Australia has two very large firms (more or less national in scope), a few large firms, and a few dozen smaller firms working in local markets. Medium size builders that have specialised in particular types of buildings and/or have developed relationships with repeat clients are also in this category.

The parts of the industry that fit the perfect competition model are the small and medium size contractors that rely on low-bid tendering to get work and labour based subcontractors, such as formwork, steel fixing, bricklaying and concreting. These firms compete solely on the basis of price.

The degree of monopoly power exercised by the largest firms in an industry is expressed in the concentration ratio, which typically uses the largest four firms in an industry, ranked by market share or sales as a percentage of total industry sales (other measures are capacity, output, employment or value added) accounted

for by the largest firms. The large contractors in the engineering construction and non-residential building sectors have the characteristics of an oligopoly. There are significant barriers to entry through client prequalification requirements for technical capability, track record and financial capacity.

Two subcontracting sectors are also highly concentrated (although these are not subcontractors in the same sense as plumbers or mechanical services). There are only three major manufacturers that supply lifts and building automation systems (BAS) respectively.

## SIGNIFICANCE OF BARRIERS

Generally, labour-intensive subcontractors and small contractors can be assumed to operate under perfect competition and are therefore not included in this analysis (i.e. these firms compete on price and offer identical products). Following the division of subcontractors and contractors shown in Table 1, the breakdown of barriers across the three market types is applied to both in Table 2.

Construction	Perfect Competition	Monopolistic competition	Oligopoly
Subcontractors	Labour based subcontracting	Mechanical services (HVAC), demolition	Lifts, building automation
Contractors	Many small and medium contractors	Some medium sized contractors	Large head contractors

Table 1. Construction Industry Firms by Market Type

Barriers to Entry	Monopolistic Competition		Oligopoly	
	H	D	H	D
Economies of scale	Low	Medium	Medium	High
Supply chains	Medium	Medium-High	Medium	M-H
Incumbent cost advantages	Medium	High	High	High
Private information	Medium	High	High	High
Contestable markets	No	No	No	No
Client imposed barriers	Medium	High	Medium	High
Cost of investment for entry	Medium	Medium-High	High	High
Market power of incumbents	Medium	High	High	High
Acquisition of technology, skills	Medium	Medium-High	Medium	
Access to capital	Medium	Medium	High	High
State of the market	High	High	High	High
Intensity of competition	Medium	High	High	High
Research & development	Low	High	Medium	High

Note: H is Homogeneous and D is Differentiated product type.

Table 2. Importance of Barriers to Entry

In Table 2 the first six barriers to entry are from Gruneberg and Ive (2000), the second six are from de Valence (2003). Research and development (R&D) is found as a barrier in

many analyses (see Scherer and Ross 1990) and has been added. The two market types of monopolistic competition and oligopoly are divided into those with homogeneous and those with differentiated products. For each of

these market types the significance of entry barriers is identified. In these types of markets barriers would be expected to be medium or high, and this is shown in the table. The exception is contestability, which is not a characteristic here because there will always be some sunk costs associated with entry, at the minimum these would be bidding costs for the first project.

Capital intensive subcontractors and medium sized contractors will typically be in monopolistic competition, and could have either homogeneous or differentiated products, depending on the specific sector they are in and clients they work for. The type of project and procurement method determines whether large contractors are in a homogeneous or differentiated market, and subcontractors that have significant R&D, capital intensity and strong client relationships are in a differentiated monopoly.

## CONCLUSION

This paper has surveyed the literature on an important economic characteristic of markets as they apply to the construction industry. The purpose was to assess the role of barriers to entry in the industry. From previous research, both Gruneberg and Ive's six barriers, and the six used by de Valence were included in the analysis. Both of these previous studies agreed on the importance of client procurement processes in allowing access to projects for contractors. A combination of the two approaches gave a dozen significant barriers to entry operating in construction markets.

The importance of these barriers depends on the specific market structure, with the two market types of monopolistic competition and oligopoly being divided into homogeneous and differentiated products. For each of these market types the significance of entry barriers was identified, with the barrier being low, medium or high for new entrants. What is apparent in this analysis is that markets with differentiated products generally have higher barriers to entry than those with homogeneous products, and the latter are more capital-intensive than the former.

Viewing the construction industry as predominantly made up of small firms supports the view of the industry as being an industry with the characteristics of perfect competition. However, this is also an industry with a small number of large contractors and some evidence of concentration. At this level the industry has barriers to entry due to the

prequalification systems and capability requirements used by clients to select contractors for major projects. Oligopolistic competition focuses on competition through product differentiation, or in the case of building and construction through specialisation in particular types of projects (eg. bridges, high-rise), forms of procurement (eg. design and build, negotiated work), finance and PFI type projects, or relationships with clients (such as alliancing or partnering). Suppliers of lifts and building automation systems are also in this type of market because there are only three major manufacturers of these products.

Between these two market structures there are some firms in the industry that are in monopolistic competition. Those medium size contractors that have specialised and differentiated their product from others, or have developed ongoing relationships with clients (and thus get a large amount of negotiated work), have clearly broken out of the price-driven competition end of the business. Also, there are subcontractors in the HVAC sector that have developed the characteristics of monopolistic competition.

This breakdown of barriers to entry in construction markets is considerably more detailed than others previously available. The next step would be to allocate these barriers to specific projects, trades and contractor types. From this a standard analysis of competitive behaviour can then be followed when analysing construction firms.

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