

# **THEORETICAL ISSUES OF INDUSTRY STRUCTURE APPLIED TO THE BUILDING AND CONSTRUCTION INDUSTRY**

**Gerard de Valence**

*Faculty of Design, Architecture and Building  
University of Technology, Sydney  
PO Box 123 Broadway NSW Australia 2007*

## **ABSTRACT**

The building and construction industry is typically seen as a very competitive industry. However, the economic analysis of an industry begins with a study of its structure, and in industry economics the definition of the relevant 'market' is the determining factor when analysing the nature of competition and structural characteristics of an industry. This paper argues that the building and construction industry is a case where the traditional structure-conduct-performance model that is widely used in industry economics cannot be easily applied. Initially, the theoretical framework of the four types of market structure and the characteristics used to classify an industry are outlined, and this is followed by a brief discussion on the different ideas of competition found in economics. The paper then details the structure of the Australian building and construction industry by firm size, employment, output and other business characteristics using data from three construction industry surveys done over 15 years. The models of market structure are then applied to the industry data to identify the relevant characteristics of different sectors in the industry. The conclusion finds that the structure of the industry depends on the definition of 'market' and 'industry' applied, and the degree of competitiveness of different sectors of the industry varies greatly.

Keywords: Building and construction, competition, industry structure.

## **1.0 INTRODUCTION**

The traditional structure-conduct-performance approach to industry economics originated in the US in the 1930s with the work of Mason (1939) and Bain (1959). This is now the standard framework for analysing dynamics of an industry. Industry analysis has traditionally focused on groups of firms with similar characteristics in their production processes, goods or services, and markets served in the wider economy. The distinction has been between firms and industries, and the analysis has emphasised the importance of economies of scale and scope (Sutton 1991, 1999) or organisational structure (Williamson 1979). One major difficulty in the standard structure-conduct-performance approach has been definition of industries within theoretical criteria of product homogeneity.

Further, some analysts see the construction industry as a manufacturing system, similar to the automotive industry. This view underpins the recommendations in the Egan Report (1998) in the UK, which emphasises lean thinking in construction. This analogy argues

the industry in Australia has a few very large key players whose task it is to 'assemble' constructed items, complete buildings or transport facilities for example. These key firms play the same role in both 'production' and innovation as the automotive assemblers, except that they do not have a fixed place of assembly. Bjornsson (1998) suggests that in the future these large contractors will also resemble the auto assemblers in that they will be much bigger and fewer - perhaps ten in the world in twenty years time. These 'assemblers' are in the process from moving from being 'demand-driven' in the sense of dependency on 'hard money' projects and traditional clients, to being demand-inducing, as they actively create opportunities through equity stakes and new forms of project delivery and finance. It should be said that the analogy with car manufacturers is controversial, and at variance to traditional views like Raftery (1991: 39-42) and Hillebrandt (1984).

The Australian Government's construction industry policy document *Building for Growth Analysis* had the comment "The industry is in the first stage of a global industrial formation that, by 2010 will see it dominated by perhaps 10 large firms" (ISR 1999: 45). For a global consolidation on the scale suggested to take place the structure of the industry would have to undergo one of the most dramatic examples of concentration ever. However, not all the evidence supports that outcome (de Valence, 2001). Clearly, the future structure of the building and construction industry is becoming a point of debate among researchers and analysts. However, what is the industry's structure? The objective of this paper is to assess market structure issues associated with the construction industry.

## **2.0 INDUSTRY STRUCTURE AND COMPETITION**

The economic analysis of industry has resulted in a framework of four types of market structures, each one having a set of distinctive characteristics. Table 1 shows the relationship between the four models of market structures found in economics texts and the characteristics of each type. The extent of control over prices is determined by the intensity of competition in a market, which is determined by the number of firms and type of product. The degree of monopoly power exercised by the largest firms in an industry is the concentration ratio, the degree to which an industry is dominated by the largest firms. A monopoly has one producer, therefore the concentration ratio is 100%, while under perfect competition there are many firms none of which has any market power.

Another approach to market structure is to base the distinction on product homogeneity (sameness) or heterogeneity (differentiation). Using this approach monopoly and perfect competition are similar, with homogeneous products, and oligopoly and monopolistic competition are similar, with differentiated products (Scherer and Ross 1990: 17). Scherer and Ross also develop and define two different ideas of competition in economics, one emphasizing the conduct of sellers and buyers and the other emphasizing market structure. On the conduct side, competition depends on resources moving from industries where returns are low to those with comparatively high returns. This requires the absence of barriers to resource transfers. A different, structural concept of competition sees a market as competitive when the number of firms selling a homogeneous commodity is so large, and each individual firm's share of the market is so small, that no individual firm can influence price by varying the quantity of output.

Table 1. Market Structures and Characteristics

Characteristics	Perfect Competition	Monopolistic competition	Oligopoly	Monopoly
Number of firms in market	Very large	Many	Few	One
Product	Identical, standardised	Differentiated	Either identical or differentiated	Unique, no close substitutes
Barriers to entry	None	Few	Significant	Very high
Firm's control over price	None	Limited	Constrained	Considerable, often regulated
Non-price competition	None	Emphasis on brand names, trademarks	Through product differentiation	Use of PR and advertising
Concentration ratio	0	Low	High	100
Examples	Agriculture, dry cleaning	Retail, cleaning, electrical goods	Automobiles, chocolate bars	Water, gas distribution

Source: Adapted from McTaggart, Findlay and Parkin 1999: 13.4.

Competitiveness has also become an important element in the economic performance of countries and those industries that are exposed to international competition. The competitiveness of nations in the global economy lies in the four broad attributes of a nation described by Porter (1991), attributes that individually and as a system constitute Porter's 'diamond of national advantage'. This is the playing field that each nation establishes and operates for its industries. These attributes are:

1. Factor conditions - the nation's position in factors of production, such as skilled labour or infrastructure, necessary to compete in a given industry.
2. Demand conditions - the nature of home-market demand for the industry's product or service.
3. Related and supporting industries - the presence or absence in the nation of supplier industries and other related industries that are internationally competitive.
4. Firm strategy, structure, and rivalry - the conditions in the nation governing how companies are create, organized, and managed, as well as the nature of domestic rivalry. (Porter 1991: 139)

### 3.0 FIRMS, INDUSTRIES AND MARKETS

In the one-product perfect-competition market model the relationship between firms, the 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 this case industry and market are not equivalent. As a result there is an ongoing debate about the industry, market or firm as the appropriate level for analysis.

Theories of imperfect competition (Chamberlin 1932, Robinson 1933) focused attention on the structure of markets, and led to the structure-conduct-performance paradigm. However, as an analytical framework for large diversified enterprises this framework may not be suitable. While the behaviour and performance of small firms may be strongly influenced by the exogenously determined structure of their market, because they are assumed to operate under conditions of perfect or near-perfect competition, for large diversified firms the influence of market structure on behaviour and performance is less marked.

There are problems with the structure-conduct-performance framework. Diversified firms have a number of products and participate in a number of markets. Further, many firms possess the ability to alter the level of output and prices in a given market, often through technical innovations that affect customers' willingness to pay for their particular products. In this case, the conduct of large firms may change market structure. Also, the existence of market imperfections gives individual firms a degree of discretion in the goals that they pursue, and discretion in the forming of business goals weakens the dependence of market performance upon market structure.

For the construction industry the definition of the market is particularly opaque. Are all buildings and structures to be regarded as a single product, or are bridges, shopping malls and apartment blocks distinct and different markets? Some firms cross these boundaries, some stay within them. It can be argued that the role of builders and contractors is to organise the production process, thus providing a service, while the delivery of the product (a building or structure) is the responsibility of the subcontractors who carry out the work.

#### **4.0 THE CONSTRUCTION INDUSTRY**

The construction industry in Australia accounted for just under 7% of GDP and nearly 8% of total employment in 1999-2000. The output of the construction industry is composed of three distinct industry sectors: engineering construction, non-residential building, and residential building. They are not closely related, having their own distinguishing characteristics, and the volatility of the industry is not equally distributed across them.

There have been four Construction Industry Surveys (CIS) done by the Australian Bureau of Statistics (ABS). The fourth and most recent was for 1996-97. Table 2 shows three CIS for 1984-85, 1988-89 and 1996-97, and the distribution of firms across the industry sectors. The doubling in the number of subcontracting firms is the most notable feature. This reflects the trend toward contract employment, which is cheaper than full-time employees, and due to low-bid tendering driving prices down across the industry.

All four surveys have found the construction industry is overwhelmingly made up of small firms with under 20 employees, which contribute most of the industry's output and

account for almost all of the total number of enterprises. Table 3 shows the numerical dominance of small firms in the construction industry. Businesses with employment of less than five accounted for 94% of all businesses in the industry, and over two-thirds of all employees. In contrast, less than 1% of businesses had employment of 20 or more.

Table 2. Private Sector Construction Establishments: Number operating ('000).

	1996-97	1988-89	1984-85
Total building construction	33.1	19.6	24.5
Total non building construction	3.1	3.9	3.4
Total general construction	36.3	23.5	27.9
Total special trade construction	158.0	74.5	77.0

Source: ABS 1996-97, 1988-89 and 1984-85 *Construction Industry Surveys*.

Table 3. Summary of Performance by Business Employment Size

Selected indicators	Units	Employment less than 5	Employment 5 to 19	Employment 20 or more	All businesses
Operating businesses	'000	182	11.1	1.2	194.3
Employment	'000	332.2	85.9	66.0	484.1
Wages and salaries	\$m	3 221.7	2 309.8	2 648.3	8 179.8
Turnover	\$m	27 951.2	13 713.7	16 234.0	57 898.8
Total income	\$m	28 202.5	13 801.0	16 591.2	58 594.7
Total operating expenses	\$m	24 123.0	13 288.0	15 987.1	53 398.1
Operating profit before tax	\$m	4 066.5	616.4	781.7	5 464.6
Industry gross product	\$m	8 657.2	3 582.2	3 941.9	16 181.2

Source: ABS. Private Sector Construction Industry, 1996-97. Cat. No. 8772.0.

Businesses with employment of less than five accounted for slightly less than half the total income and expenses, whereas businesses with employment of 20 or more accounted for almost one-third of these items. Almost three-quarters of construction industry profit before tax came from businesses with employment of less than five. Higher profit margins were reported by smaller businesses, so the numerical dominance of businesses with employment less than five drives the industry average above the profit margins reported by businesses with employment of five or more.

When the data on performance is converted to percentages (Table 4) the importance of the 0.62% of large firms can be appreciated. Their 13.6% of employee earn 32.3% of salaries and wages, generate over 14% of profits and nearly 25% of output. Despite the number of small firms, the large firms in the industry clearly play a significant role. As the tables show, firms with 20 or more employees contribute a disproportionate share of industry value added, turnover and employment. The largest contractors belong to the Australian Contractors Association (ACA). The latest *Annual Report* of the organisation

gives total turnover of the 18 members in 1997- 98 as over \$15 billion, over half total non-residential construction for that year, and employment of over 49,000 (ACA 1998).The 1995-96 *Annual Report* stated "members account for around 40% of total construction activity in Australia" (ACA 1996: 2).

Table 4. Percentage by Firm Size

Selected indicators	Employment less than 5	Employment 5 to 19	Employment 20 or more	All businesses
Operating businesses	93.67	5.71	0.62	100.00
Employment	68.62	17.74	13.63	100.00
Wages and salaries	39.39	28.24	32.38	100.00
Turnover	48.28	23.69	28.04	100.00
Total income	48.13	23.55	28.32	100.00
Total operating expenses	45.18	24.88	29.94	100.00
Operating profit	74.42	11.28	14.30	100.00
Industry gross product	53.50	22.14	24.36	100.00

Source: Table 3.

Therefore the industry can be seen as highly concentrated, with the largest firms accounting for more than 50% of industry output in the non-residential building and engineering construction sectors (these companies do little residential work, although their turnover includes some high-rise residential and contract mining work). Therefore the biggest firms in the construction industry dominate the industry's output and industry cash flow. The shape of the industry structure is that of a flat pyramid, with a handful (20) of very large contractors and a few (1,200) large contractors at the top, and many small subcontractors in the bottom section.

## 5.0 MARKET SECTORS IN CONSTRUCTION

In the industrial organization or industry economics literature, industries are usually seen in terms of a number of firms which advance along a single technological trajectory, and these firms compete in enhancing the quality of their individual versions of the same basic product (homogeneity of product). This view fits some industries well, however many industries encompass several groups of products rather than a large number of versions of a single product. The products may be close substitutes in consumption, but embody different technologies, where R&D projects that enhance products in one group may generate huge spillovers for products in other groups.

Such complex overlapping patterns of substitutability have bedevilled industrial organization analysis for decades, since Chamberlin (1932) first developed the definition of an industry as limited by the chain of substitution, where industries were defined by their product. If industries are broken into separate sub-industries in order to address this problem, the choice can be between any number of different groups of products. The products may be close or distant substitutes for products of firms on other technological trajectories. When the linkages are strong they reflect the presence of scope economies,

where the linkages are weak these scope economies will be absent and there will be a low degree of substitution across sub-markets.

Applying this discussion of sub-markets to the building and construction industry raises a number of interesting issues. The first is, of course, the general lack of specialisation of firms in the construction industry in terms of their product. The answer to the question "What does the industry produce?" is varied; some believe that the industry provides services (management, coordination, finance), others believe the industry delivers products (buildings and structures). The former group argues that the main task of the industry is one of coordinating site processes while the latter are more concerned with the building itself. The building and construction industry is typically broken into the engineering, non-residential, and residential building sectors, and there are some firms that cross all of these areas, however, typically firms work in either the residential or the non-residential sectors. Many of the larger firms cover both engineering and non-residential building in their activities. Within the non-residential building sector, there are ten or twelve different sub-markets, divided into offices, retail, factories, health, and so on. Some firms specialize in building particular types of buildings, in Australia Grocon specialises in high-rise office buildings and Westfield specialises in shopping centres, however more commonly a building contractor will apply their management skills to a range of building types, and not limit themselves to specific sub-markets. In this case, for the construction industry, sub-markets are difficult to identify because firms can be highly specialized in one area, or they can be highly generalized and put up a wide range of buildings and structures.

## **6.0 MARKET STRUCTURE**

From the data on the construction industry, what can be said of market structure? 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 form that the more capital intensive subcontractors in the heating, ventilation and air conditioning (HVAC) sector. This part of the industry in Australia has four large firms (more or less national in scope) 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 fits 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.

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.

Table 5. Construction Industry Characteristics

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

Two subcontracting sectors are also highly concentrated. There are only three major manufacturers that supply lifts and building automation systems (BAS).

If the ACA claims and ABS data are taken into account, the construction industry appears to be dominated by a few large contractors (enterprises). These large enterprises are commonly linked to groups of smaller specialist contractors. The industry can thus be seen as operating as clusters of firms competing on the basis of the contractor's management ability and the skills provided by the associated subcontractors. This applies to both the residential and non-residential sectors, with project managers on commercial building and engineering works and the major builders of project homes typically subcontracting out 90% or more of the work done.

## 7.0 CONCLUSION

The importance of industry structure to industry economics lies in the way that structure is seen as the most important determinant of competition in an industry, and the form that competition takes. The extent of control over prices is determined by the intensity of competition in a market, which is, in turn, determined by the number of firms and type of product. Related issues are the way the process of competition affects prices and profits, the ease of entry of new firms into or frequency of exit from an industry, the impact of demand shocks (i.e. the business cycle) and the effects of new technologies.



The economic analysis of industry has resulted in a framework of four types of market structures, each one having a set of distinctive characteristics. Table 5 showed the relationship between the construction industry and the three relevant models of market structure, with the characteristics of each type. It was argued that the answer to the question "What is the form market structure takes in the building and construction industry?" depends on the specific part of the industry being analysed.

The construction industry is predominantly made up of small firms, so the traditional approach based on the number of firms, barriers to entry and market power reveals the typical view of a fragmented, diverse industry of firms with low barriers to entry. This supports the view of the industry as being an industry with the characteristics of perfect competition. The practice of open tenders has been abandoned in Australia, but continuing widespread use of low bid tendering and reliance on price competition encourages the view that the industry is perfectly competitive.

However, the data also shows an industry that is highly concentrated in a small number of large contractors. At this level the industry is oligopolistic, with high 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 (e.g. Design and Build, negotiated work), finance, or relationships with clients (alliancing, partnering). Suppliers of lifts and building automation systems are also in this type of market.

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.

For many of the issues associated with questions about the performance of the construction industry the traditional structure-conduct-performance model may not be applicable. This is in part due to structural characteristics of the industry and the processes used to deliver buildings and structures, and partly due to the project based nature of the industry, where a sequence of projects is the focus rather than the production process itself. In conclusion, it appears that the appropriate model of the construction industry's market structure will depend on the definition of industry products or markets adopted and the sector of the industry that is to be analysed. 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.

The importance of this finding has implications in two key policy areas. Firstly, in competition policy, administered by the Australian Competition and Consumer Commission and its counterparts overseas, determinations of anti-competitive behavior

are based on the definition of 'market' and 'industry' used. From the data in this paper it is clear that the definition of the industry is far from being a settled issue. Therefore, the appropriate definition of the 'industry' for competition policy will depend on the specific 'market' under consideration. Secondly, despite repeated efforts by Governments, both in Australia and elsewhere, the performance of the industry, using measurements such as the rate of productivity growth, levels of research and innovation, training and process improvement, is often seen as poor. One part of the explanation for the failure of industry policy in the past is the misunderstood structure of the industry, and the implications of that misunderstanding for policy initiatives.

## REFERENCES

- ABS (1996-97, 1988-89, 1984-85). *Construction Industry Surveys*. Australian Bureau of Statistics, Cat. No. 8772.0.
- ACA, 1996, 1998. *Annual Reports*, Australian Contractors Association, Sydney.
- Bain, J. S. (1959). *Industrial Organisation*. Wiley, New York.
- Bjornsson, H. (1998). "IT Revolutionises Construction." *Building Innovation and Construction Technology 2*.
- Chamberlin, E. H., 1932. *The Theory of Monopolistic Competition*, 1st Edition Cambridge, Mass., Harvard UP, Mass
- de Valence, G., (2001). *Trends in Procurement and Implications for Innovation and Competitiveness of Australian Building and Construction*, CIB W65 World Building Congress, Wellington N.Z..
- Egan Report (1998). *Rethinking Construction*. Department of Environment, Transport and the Regions, London.
- Hillebrandt, P. (1984). *Economic Theory in the Construction Industry*. MacMillan, London.
- ISR (1999). *Building for Growth: An Analysis of the Australian Building and Construction Industries*. Department of Industry, Science and Resources, Canberra..
- McTaggart, D., Findlay C. and Parkin M., 1999. *Economics*, Third Edition, Addison-Wesley, Melbourne
- Mason, E. S. (1939). "Price and Production Policies of Large-Scale Enterprise." *American Economic Review*, 29, March, 61-74.
- Porter, M. E. (1991). *The Competitive Advantage of Nations*. Free Press, New York.
- Raftery, J. (1991). *Principles of Building Economics*. BSP Professional Books, Oxford.
- Robinson, J., 1933. *The Economics of Imperfect Competition*, Macmillan, London.
- Scherer, F.M. and Ross, D., 1990. *Industrial Market Structure and Economic Performance*, 3rd Edition, Houghton Mifflin, Boston.
- Sutton, J. (1999). *Technology and Market Structure: Theory and History*. MIT Press, Cambridge, Mass.
- Sutton, J. (1991). *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration*. MIT Press, Cambridge, Mass.
- Williamson, O. E. (1979). "Transaction-Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics*, 22, 233-61.