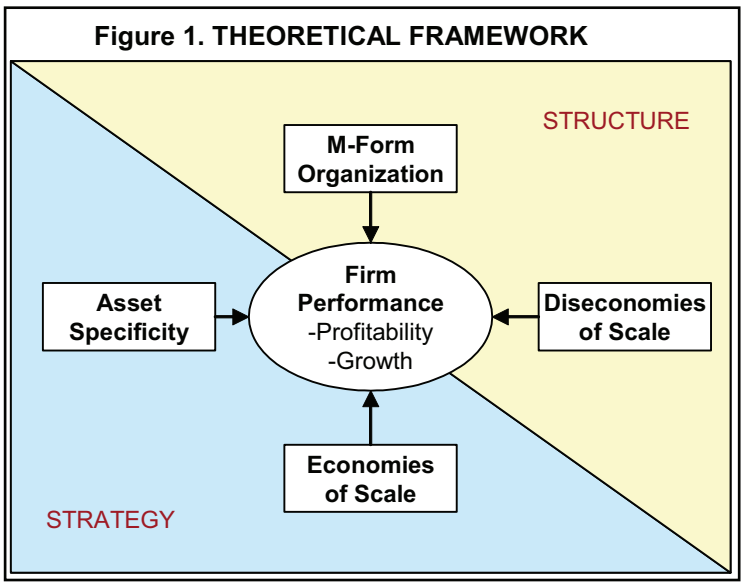
STRATEGY AND STRUCTURE IN INTERACTION: WHAT DETERMINES THE BOUNDARIES OF THE FIRM?

Dr. Staffan Canbäck, Henley Management College[1]
Prof. Phillip Samouel, Kingston Business School[2]
Dr. David Price, Henley Management College

This paper explores the interaction between strategy and structure in large firms. Based on transaction cost economics (TCE), it describes a theoretical framework for understanding the boundaries of the firm and the mechanisms that contribute to a firm's performance at these boundaries (Figure 1).

Figure 1. THEORETICAL FRAMEWORK



It is shown that four interrelated mechanisms influence firm performance. Two factors are strategic in nature: *asset specificity* and *economies of scale*, while two factors are structural: *M-form organization* and *diseconomies of scale*. The framework is validated against the literature and tested by applying structural equation models to primary and secondary cross-sectional data from 784 large U.S. manufacturing firms.

The paper is an outgrowth of earlier research (Canbäck 2002) on the nature and magnitude of managerial diseconomies of scale within large firms.

Problem Definition

Observers from Knight ([1921] 1964) to Holmström and Tirole (1989) have pointed out that our understanding of bureaucratic failure, and its impact on firm boundaries, is low. No business organization in the United States has more than one million full-time employees or more than ten hierarchical levels. No firm has ever been able successfully to compete in multiple markets with a diverse product range for an extended period of time. Common sense tells us that there are limits to firm size. Common sense does not, however, prove the point.

Literature Review

TCE offers a framework for understanding the boundaries of the firm. It shows that the boundaries are set at the point where the cost of internal (administrative) transactions equal the cost of external (market transactions (Coase 1937; Williamson 1981; Holmström and Roberts 1998) . Furthermore, it is possible to create a theoretical framework for empirically analyzing these boundaries based on Williamson (1975, 1985) and Riordan and Williamson (1985).

Organization form. Williamson (1975, 117) recognized that the boundaries of the firm can be expanded by organizing appropriately. Based on Chandler's pioneering work (e.g., 1962) on the evolution of the American corporation, Williamson argued that the M-form organization lowers internal transaction costs compared to the U-form organization. It does so for one key reason: The M-form allows most senior

[1] Henley Management College, The Greenlands, Henley-on-Thames, Oxon RG9 3AU, United Kingdom
[2] Kingston Business School, Kingston Hill, Kingston-upon-Thames, Surrey KT2 7LB, United Kingdom

executives to focus on high-level issues rather than day-to-day operational details, making the whole greater than the sum of its parts (p. 137). Thus, large firms organized according to the M-form should perform better than similar U-form firms (see also, e.g., Teece 1981; Fligstein 1985).

Diseconomies of scale. This influence is rarely discussed in the literature. Williamson (1975, 1985) showed that four factors are important.

Atmospheric consequences. According to Williamson (1975, 128–129), as firms expand there will be increased specialization, but also less commitment on the part of employees. In such firms, the employees often have a hard time understanding the purpose of corporate activities, as well as the small contribution each of them makes to the whole. Thus, alienation is more likely to occur in large firms. Support among authorities includes Child (1973), Scherer (1976), Blau and Meyer (1987) and Qian (1994) .

Bureaucratic insularity. Williamson (1975) argued that as firms increase in size, senior managers are less accountable to the lower ranks of the organization (p. 127) and to shareholders (p. 142). They thus become insulated from reality and will, given opportunism, strive to maximize their personal benefits rather than overall corporate performance. According to Williamson, this problem is most acute in organizations with well-established procedures and rules and in which management is well-entrenched. As a consequence, large firms tend towards organizational slack. Relevant support is, for example, found in Pugh et al. (1969), Olson (1982), Jensen (1986), Brock (1987) and Carroll and Hannan (2000).

Incentive limits of the employment relation. Williamson (1975, 129–130) argued that the structure of incentives large firms offer employees is limited by a number of factors. First, large bonus payments may threaten senior managers. Second, performance-related bonuses may encourage less-than-optimal employee behavior in large firms. Therefore, large firms tend to base incentives on tenure and position rather than on merit. Such limitations may especially affect executive positions and product development functions, putting large firms at a disadvantage when compared with smaller enterprises in which employees are often given a direct stake in the success of the firm through bonuses, share participation and stock options. Supporting evidence is found in Cooper (1964), Schmookler (1972), Zenger (1989, 1994), Peters (1992), Williamson (1996) and Axtell (1999), among others.

Communication distortion due to bounded rationality. Because a single manager has cognitive limits and cannot understand every aspect of a complex organization, it is impossible to expand a firm without adding hierarchical layers. Information passed between layers inevitably becomes distorted. This reduces the ability of high-level executives to make decisions based on facts and negatively impacts their ability to strategies and respond directly to the market (Williamson 1985, 148–152). Williamson (1967) found that even under static conditions there is a loss of control. Supporting evidence is found in Simon ([1947] 1976**)**, Arrow (1974, 1983), Geanakoplos and Milgrom (1991), McAfee and McMillan (1995) and Mookherjee and Reichelstein (2001), among others.

Economies of scale. Transaction cost economics does not usually deal with economies of scale, which are more often associated with neoclassical production costs. However, Riordan and Williamson (1985) made an explicit attempt to reconcile neoclassical theory and transaction cost economics and showed, among other things, that economies of scale are evident in both production costs (p. 371) and transaction costs (p. 373), and that both can be kept internal to a firm if the asset specificity is positive. That is, economies of scale can be reaped by the individual firm and are not necessarily available to all participants in a market (pp. 367–369). This is at odds with much of the literature, but Canbäck (2002) showed that there is at least some validity to Riordan and Williamson's argument.

Asset specificity. Williamson showed that asset specificity is the most important determinant of degree of integration (e.g., Riordan and Williamson 1985, 366). Asset specificity influences integration from a geographic reach, product breadth and vertical depth point of view.

Geographic reach. Teece (1976) showed that multinational firms only exist because the combination of asset specificity and opportunism leads to moral hazard, which is difficult to contain in market

transactions. Without, for example, human asset specificity, a firm could just as easily license its technology to a firm in another country, reaping the benefits of development. Tsokhas (1986) illustrated this in a case study of the Australian mining industry. Other studies have shown that market diversity reduces profitability (e.g., Bane and Neubauer 1981).

Product breadth. A number of studies of product breadth show that asset specificity plays a major role in explaining the success and failure of diversification. Notably, Rumelt (1974) found a strong correlation between profitability and human asset specificity—in this case the degree to which a firm draws on common core skills or resources (pp. 121–127).

Vertical depth. Asset specificity has repeatedly been shown to be the primary determinant of vertical integration. A number of empirical studies confirm this (e.g., Masten 1984; Masten, Meehan and Snyder 1989, 1991; Monteverde and Teece 1982; Joskow 1993).

The complete paper discusses these influences in more detail and reviews more than 100 authorities. Based on this, four main hypothesis and two supporting hypothesis are formulated (Table 1).

Table 1. HYPOTHESES	
Main hypotheses	**H_1**: M-form organization improves firm performance
	H_2: Diseconomies of scale from bureaucratic failure have a negative impact on firm performance
	H_{2a}: Atmospheric consequences have a negative impact on the performance of large firms
	H_{2b}: Bureaucratic insularity has a negative impact on the performance of large firms
	H_{2c}: Incentive limits have a negative impact on the performance of large firms
	H_{2d}: Communication distortion has a negative impact on the performance of large firms
	H_3: Economies of scale increase the relative profitability of large firms over smaller firms
	H_4: High asset specificity improves firm performance
Supporting hypotheses	**H_5**: Diseconomies of scale increase with firm size
	H_6: Large firms exhibit economies of scale

Methodology

Structural equation modeling (SEM) was selected for the statistical analyses, based on Hair et al.'s classification scheme for choosing among multivariate techniques (1998, 20–21).

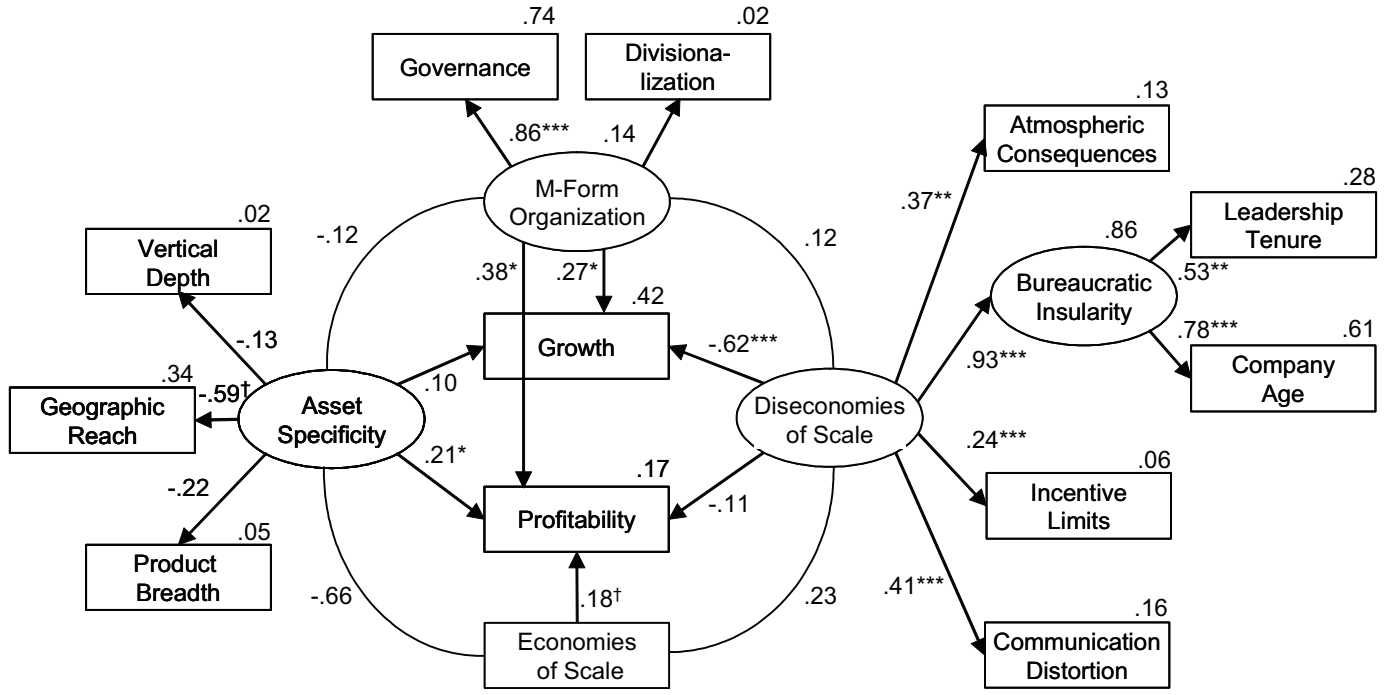
The analyses were cross-sectional. Data were collected for publicly traded manufacturing firms (SIC codes 10–39) with headquarters in the U.S. and with sales of more than $500 million. 1998 was the benchmark year. Primary and secondary data were derived from several sources, including company organization charts, official filings such as 10-Ks and proxy statements, annual reports, biographies of executives, historical company documents, corporate websites, articles in *Business Week* and *Fortune*, corporate watchdogs (e.g., IRRC), Compustat and academic research.

The data was screened extensively for missing values, non-normality, non-linearity, heteroscedasticity, etc. Despite issues such as many missing values, non-normality of certain variables and some heteroscedasticity, the data was deemed more than sufficiently robust for the structural equation models.

Results

Figure 2 shows a path diagram for the most important statistical analysis of the main hypotheses (model *a*). This analysis tests hypotheses 1 to 4 (model *b* tests hypotheses 5 and 6) and depicts the delicate balance between factors that reduce the limits of firm size and those that increase the limits. A positive regression weight increases the limits and a negative regression weight reduces the limits. In general, diseconomies of scale have a stronger negative influence on growth than on profitability, while the positive influence of economies of scale, M-form organization and high internal asset specificity is larger on profitability than on growth.

Figure 2. STRUCTURAL EQUATION MODEL
Simplified structure
Standardized values



Note: † p<10%, * p<5%; ** p<1%; *** p<.1% (two-tailed)

Table 2 summarizes the literature findings and the full set of statistical analyses. All hypotheses (except $\mathbf{H_4}$) were confirmed at better than 5% significance and each statistical model had an overall fit which was acceptable or better. Combined with the findings from the literature, this implies that firms have to balance a number of countervailing forces to reach a performance optimum. For example, it is unlikely that geographic or product expansion alone will improve corporate performance. Only when the expansion is done in conjunction with other adjustments, aimed at reducing the diseconomies of scale or capturing the benefits of M-form organization, is it likely that performance will improve.

Table 2: SUMMARY OF FINDINGS

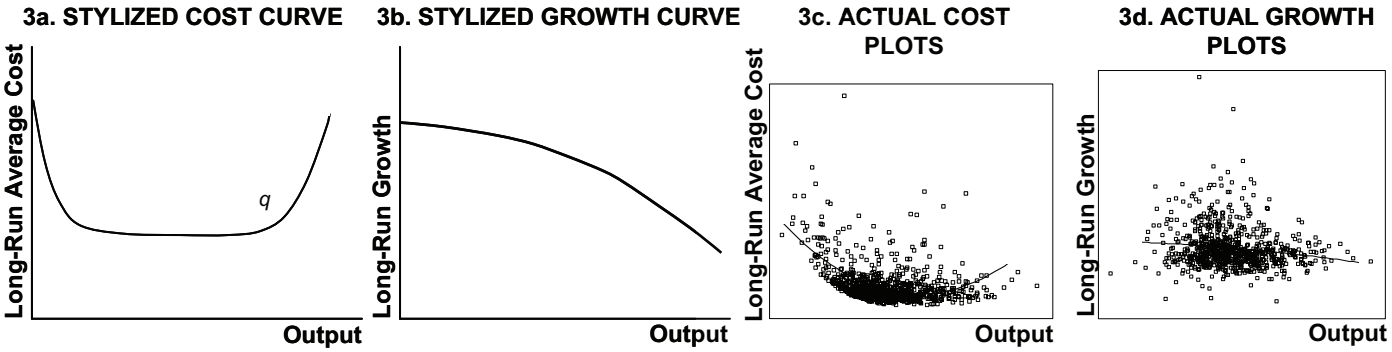
Hypothesis	Model	Literature Finding	Statistical Finding	
			Result	Significance
H_1	*a*	Confirmed	Confirmed	p<5%
H_2	*a*	Confirmed	Confirmed	p<0.1%
H_{2a}	*a*	Confirmed	Confirmed	p<1%
H_{2b}	*a*	Confirmed	Confirmed	p<0.1%
H_{2c}	*a*	Confirmed	Confirmed	p<0.1%
H_{2d}	*a*	Confirmed	Confirmed	p<0.1%
H_3	*a*	Inconclusive	Confirmed	p<1%
H_4	*a*	Confirmed	Confirmed	p<10%
H_5	*b*	Confirmed	Confirmed	p<5%
H_6	*b*	Confirmed	Confirmed	p<0.1%

The findings in this, and other analyses not reported here, are robust for a number of reasons. The data were screened and tested extensively. They were found to be well-behaved in most respects. The path diagrams confirm well with the underlying theory. The indicators appear to reflect the unobserved phenomena fairly well. Finally, the results were similar when random sub-samples were used.

Interpretation and Discussion

One way to illustrate the findings is by creating cost and growth curves similar to those used in neoclassical theory (Figure 3).

Figure 3. FIRM PERFORMANCE RELATIONSHIPS



Source: McConnell (1945), Stigler (1958), Canbäck (2002)

The elongated U-shaped average total cost curve hypothesized in neoclassical theory can be split into two parts: the average production cost curve and the average transaction cost curve. Based on the statistical analyses, the production cost curve is monotonously declining, while the transaction cost curve is bathtub-shaped. Combined, they take on the shape depicted in Figure 3a. Where along this curve do firms operate? The statistical analyses suggest that, on average, the largest firms in the sample operate at outputs in the lower upward-sloping region at q.

The underlying logic of the cost curves can also be applied to firm growth (Figure 3b). The diseconomies of scale exhibit a strong negative influence on growth, while the three other factors do not offset this negative influence. This may indicate that Penrose's suggestion ([1959] 1995, 261–263), that the limits of a firm are related to dynamic factors rather than static factors, is correct. A large firm will find it relatively easy to maximize profitability, but difficult to spur growth. An extension of this argument is that Gibrat's law of proportional effects (1931, 77) may not be valid for growth and firm size, in line with corporate demography research (Carroll and Hannan 2000, 315–319) and the findings of Sutton (1997).

The set of curves discussed above agree well with neoclassical theory (e.g., McConnell 1945, Stigler, 1958, Panzar 1989) and transaction cost economics (e.g., Williamson 1975), individually. The curves also agree with the joined perspectives on production and transaction costs expressed by, for example, Riordan and Williamson (1985) and Wallis and North (1986). The conceptual curves depicted in Figure 3 were also compared to the data in the sample of 784 firms. Figure 3c and 3d show the resulting graphs, which resemble the conceptual curves.

There are a number of real-life implications of the research. First, strategy and structure appear to be intimately linked. Indeed, structure does not necessarily follow strategy; strategy and structure inform each other continuously and forever. Second, much of the rationale for mergers and acquisitions seems to be weak, at best. The analysis here shows that while some economies of scale may be realized, they are likely to be offset by diseconomies of scale. Furthermore, there is no evidence that larger, merged entities innovate more and grow faster. Third, boards of directors may want to emphasize the importance of executive renewal and the elimination of rigid processes to stimulate growth. Fourth, firms that strive for high internal asset specificity appear to be better off than those that expand reach, breadth, or depth. Finally, in a world in which companies increasingly try to sell solutions rather than basic products and services, incentive limits have become real and problematic.

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