

# A STUDY OF ENTREPRENEURIAL STRATEGIES IN BIOMEDICAL AND GENETICS

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**Abstract.** This study compares two entrepreneurial strategies: speed of entry and speed of accumulation of resources after entry. It tests whether the speed of accumulation of resources after entrance overcomes the advantage gained by early entrance into bio-medical and genetics. The findings show that the effect of speed of accumulation of resources is larger than the effect of early entrance, which suggests that first mover advantages are temporary and dependent on speed of accumulation of resources. We test these propositions on a sample of firms from North America and discuss strategic implications.

**Key words:** First-Mover Advantage, Late-Mover Advantages, Resources, Bio-medical and genetics, Entrepreneurial strategies

## Introduction

How different are the effects of early entrance and of rapid accumulation of resources on firm performance? Understanding the impact of timing of entry and the impact of speed of accumulation of resources is crucial for corporate managers facing high velocity environments (Christensen, 1997; Eisenhardt, 1989; Eisenhardt and Tabrizi, 1995; Lieberman and Montgomery, 1998). The case of the biomedical and genetics industry offers a particular opportunity for studying these issues from the perspective of practitioners and academics. Bio-medical and genetics technologies are transforming the life sciences throughout all discovery and development processes. This emerging multidisciplinary field brings professionals from biotechnology, pharmaceutical, healthcare, academic and government decision makers to learn how the latest tools, services and best management practices will help revolutionize our health, our environment and our society.

This paper contributes to a body of work addressing the impact of timing, and resources on competitive advantage (Lieberman and Montgomery, 1998; Cockburn, Henderson, and Stern, 2000) by exploring whether first mover advantages – the advantage of early entrance into a market via a creative process – are moderated by accumulation of resources after entrance. The study contributes to the strategic management literature by providing evidence on how firms combine two entrepreneurial strategies: speed of entry and speed of accumulation of resources.

## Theory and Hypotheses

Entrepreneurial strategies that accelerate entry and resource accumulation are essential for firm's growth (Lieberman and Montgomery, 1988, 1998). The resource-based view of the firm (RBV) portrays the company as a bundle of interrelated resources, capabilities and competences. These have been labeled as resources, assets, routines, and compound resources by many authors. Such unique resources yield competitive advantage because better resources lead to better products that give companies an edge over competitors (Penrose, 1959; Wernerfelt, 1984; Barney, 1986, 1991, 1996).

Early entrance is essential to achieve competitive advantage (Lieberman, 1988; 1998). Early entrants have a favourable position to acquire scarce resources from the environment faster and cheaper than competitors do. If early entrants exploit the resource opportunity then they achieve superior performance (Teece, 1987; Dierickx and Cool, 1989; Prahalad and Hamel, 1990). Thus, companies that manage to reach favourable initial conditions and race to overcome their lack of resources achieve superior performance (Nelson and Winter, 1982; Teece, 1988).

Early entrance facilitates the appropriation of scarce resources, and creates opportunities for new organizational learning which enhance competitive advantage. However, the achievement of superior performance depends ultimately on the ability that firms have to accumulate critical resources. Thus, firm performance depends on both, speed of entry and speed of accumulation of resources after entry. A two by two matrix describes the impact of speed of entry and speed of accumulation of resources on competitive advantage as follows.

		Speed of Accumulation of Resources	
		Rapid	Slow
Speed of Entry	EARLY	Very High	Moderate
	LATE	High	Low

Figure 1. Enterprise Value in the Speed of Entry versus Speed of Accumulation of Resources Matrix

Technological leadership is one of the main first mover advantages (Lieberman and Montgomery, 1988, 1998). Technological leadership can only be sustained with a continuous process of accumulation of resources. A firm that fails to do so is at risk of losing the early entrance advantage to late entrants that have a superior speed of accumulation of resources. Thus, speed of accumulation of resources produces larger competitive advantage than speed of entry. Combining this logic into the two by two matrix of Figure 1, we have the following hypotheses:

- Hypothesis 1: *Firms achieve superior performance by early entry into an industry.*
- Hypothesis 2: *Firms achieve superior performance by rapid accumulation of resources.*
- Hypothesis 3: *Accumulation of resources moderates first mover's advantage.*

### Methods

**Sample and Data:** The sample comprises 112 firms from the Bio-Medical and Genetics industry from North America. The main reference for the data is Bloomberg. We cross-referenced Bloomberg data with a variety of sources, including, MarketGuide, Hoovers, Research Insight, and SEC filings. We chose to use data from the biomedical and genetics industry because of the quickly evolving technological and competitive environment makes this a high-velocity industry. Speed is critical in high velocity environments (Bourgeois and Eisenhardt, 1988; Eisenhardt and Tabrizi, 1995). This industry is entrepreneurial per excellence

providing the ideal ground to test two essential entrepreneurial strategies. We focused on the period from 2002 because this industry presented a window suitable for research on the period right after the technology bubble-bust of 2000.

### Variables

**Independent Variable:** *Firm Performance:* measured as Enterprise Value in the last reported quarter of 2002. Enterprise Value is the Market Value plus Total Debt and Current Preferred Stock minus Cash and Equivalents.

**Dependent Variables:** *Speed of entry* is measured by two dummy variables: *early* and *late*. *Early* indicates a first mover, denoted by a firm whose initial private offering occurred before 1/1/2000. *Late* indicates a late entrant, denoted by a firm whose initial private offering occurred after 1/1/2000. The technology bubble-bust happened in the first quarter of 2000. Entering into the market via an IPO became extremely difficult right after that date. *Accumulation of resources* is measured by dummy variables: *rapid* and *slow*. We compared the accumulation of assets and accumulation of employees in the last twelve trailing months. *Rapid* indicates a company that had positive values for both their corresponding yearly change of assets and employees. *Slow* indicates a company which either yearly change of assets or employees were negative.

**Control Variables:** We controlled for the technological intensity of each firm, *PP&E intensity*, as Total Fixed Assets divided by number of employees.

**Empirical Methods:** We employed OLS regression. We also performed additional Student's tests for the significance of the differences between each parameter from the speed of entry versus speed of accumulation of resources matrix.

**Results**

*Table 1. Speed of Entry, Speed of Accumulation of Resources, and Enterprise Value <sup>a</sup>*

Dependent Variable: LOG (Enterprise Value) <sup>b</sup>		
YEAR 2002	N-AMER	
EARLY-RAPID (intercept)	0.66 (1.17)	
EARLY-SLOW	-1.63 (0.41)	***
LATE-RAPID	-0.76 (0.53)	†
LATE-SLOW	-2.39 (0.60)	***
LOG (PP&E intensity) <sup>b</sup>	0.78 (0.18)	***
R <sup>2</sup>	0.31	
Adjusted R <sup>2</sup>	0.29	
F	12.13	***
N	112	

<sup>a</sup> Matrix parameters are differences between each cell and the parameter of EARLY-RAPID, which was the benchmark. The parameter of EARLY-RAPID is the regression intercept. Standard errors are in parenthesis.

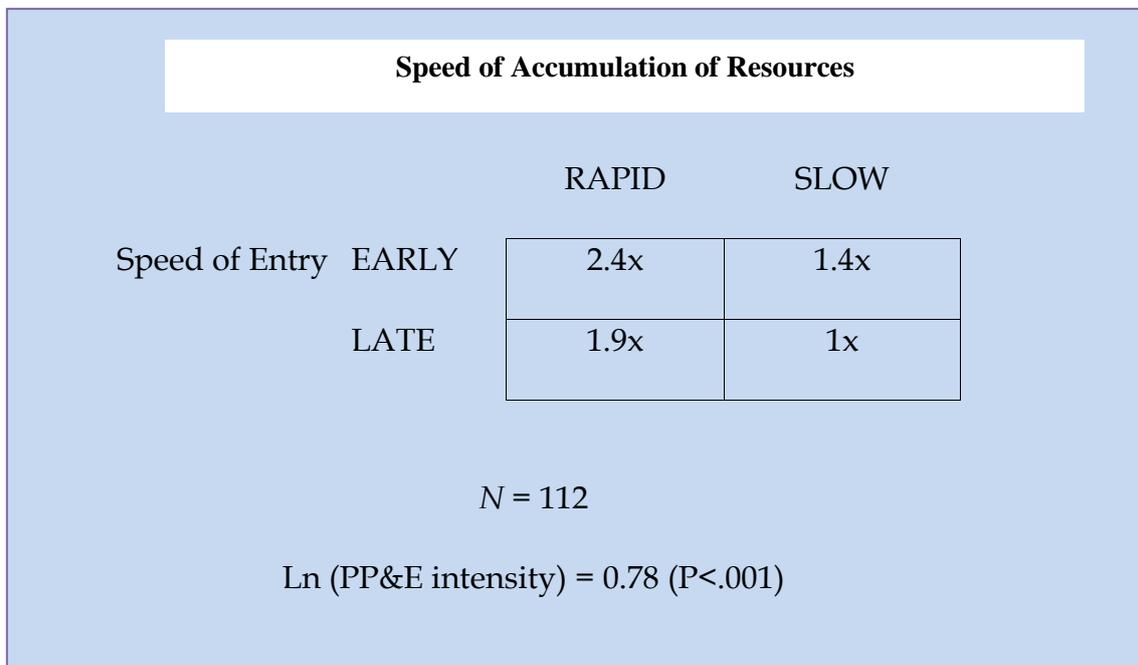
<sup>b</sup> Natural Logarithm

† p < .10

\* p < .05

\*\* p < .01

\*\*\* p < .001



*Figure 2. North American Sample relative Enterprise Value by strategy*

Note: The numbers on each the matrix cell represent the size of enterprise value relative to the late/slow position. The late/slow position is set to one.

Table 1 shows the regression results. Figure 2 shows the relative proportion of the regression coefficients within the speed of entry versus speed of accumulation of resources matrix. The numbers on each the matrix cell represent the size of enterprise value relative to the late/slow cell. The late/slow level of enterprise value is set to one.

These findings support hypotheses 1, namely, that first movers have superior performance. Early entrants have higher enterprise value than late entrants, namely, with rapid accumulation of resources, first movers are valued  $[2.4/1.9] - 1 = 30\%$  more than late movers; with slow accumulation of resources, first movers are valued  $[1.4/1.0] - 1 = 40\%$  more than late movers. Findings also show that early entrance followed by rapid accumulation of resources yields higher performance than late entrance and slow accumulation. Entrepreneurial firms have 140% higher enterprise value than non-entrepreneurial firms, as calculated as follows,  $[2.4/1.0] - 1 = 140\%$ .

These findings support hypothesis 2, namely, that the speed of resource accumulation after entrance is significant, regardless order of entry. These findings show that among first movers

enterprise give an advantage of 71% higher enterprise value when there is rapid accumulation of resources ( $[2.4/1.4] - 1 = 71\%$ ); whereas, among late movers the advantage given by rapid accumulation of resources is 90% higher enterprise value, ( $[1.9/1.0] - 1 = 90\%$ ).

## Conclusions

This study had two main purposes. First, it intended to assess the magnitude of the competitive advantage created by two entrepreneurial strategies: speed of entry and speed of accumulation of resources after entry. Second, we set out to evaluate whether late entrants with superior speed of accumulation of resources could challenge first mover advantages. We theorized that resource based advantage is desirable after entry whether the entry was early or late. We anticipated that the early entrants that accumulated resources rapidly would have the best competitive advantage over the other alternatives. We devised a two by two matrix stylizing the competitive advantage of speed of entry versus speed of accumulation of resources. The findings provide strong support for the argument that the competitive advantage gained from speed of accumulation of resources after entrance overcomes the advantage gained by early entrance into the biomedical and genetics industry.

## References

1. Barney, J. (1986). Strategic Factor Markets: Expectations, Luck and Business Strategy. *Management Science*, 32:1512-1514.
2. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.
3. Barney (1996). The resource-based theory of the firm. *Organizational Science*, 7:469.
4. Barney, J. (2001). Is The Resource-Based "View" a Useful Perspective for Strategic Management Research? Yes. *The Academy of Management Review*, Vol.26, 1:41-56.
5. Christensen, C. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Cambridge, Mass.: Harvard Business School Press.
6. Cockburn, I. R. Henderson, and S. Stern (2000). Untangling the Origins of Competitive Advantage. *Strategic Management Journal*, 21, 10-11:1123-1145.
7. Dierickx, I. and K. Cool, (1989). Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science*, Vol.35, No.12, (December), 1504-1511.
8. Greene, W. (1993). *Econometric Analysis*, 2<sup>nd</sup> edition, New York, NY: Macmillan.
9. Gulati, R. (1999). Network location and learning: the influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal*, 20, 5:397-420.
10. Gulati, R., N. Nohria, and A. Zaheer (2000). Strategic Networks. *Strategic Management Journal*, 21, 3:203-215.
11. Hamel, G. and C. Prahalad (1994). *Competing for the Future*. Cambridge, Mass.: Harvard Business School Press.
12. Helfat, C. (2000). Guest editor's introduction to the special issue: The Evolution of Firm Capabilities. *Strategic Management Journal*, 21, 10-11:1061-1081.
13. Helfat, C. and R. Raubitschek (2000). Product Sequencing: Co-evolution of Knowledge, Capabilities and Products. *Strategic Management Journal*, 21, 10-11:961-979.
14. Hsiao, C. (1986). *Analysis of Panel Data*. New York: Cambridge University Press.
15. Kogut, B. (1991). Country Capabilities and the Permeability of Borders. *Strategic Management Journal*, Vol. 12, Summer 1991.
16. Lieberman, M., L. Deemester, and R. Rivas (1995). *Inventory Reduction in the Japanese Automotive Sector*. Working paper, MIT International Motor Vehicle Program, Cambridge: Mass.
17. Lieberman, M. and Montgomery, D. (1988). First-Mover Advantages. *Strategic Management Journal*, Summer Special Issue, 9:41-58.

18. Lieberman, M. and Montgomery, D. (1998). First-Mover (DIS) Advantages: Retrospective and Link with the Resource-Based View. *Strategic Management Journal*, 19: 1111-1125.
19. Little, R., and Rubin, D. (1987). *Statistical analysis with missing data*. New York: Wiley.
20. Makadok, R. (1999). Interfirm Differences in Scale Economies and the Evolution of Market Shares. *Strategic Management Journal*, 20:935-952.
21. Miller, D. and J. Shamsie (1996). The Resource Based View in Two Environments: The Hollywood Film Studios from 1936 - 1965. *Academy of Management Journal*, 39:519-543.
22. Nelson, R. and Winter, S. (1982). *An Evolutionary Theory of Economic Change*. Cambridge: Mass.: Beljnap Press of Harvard University.
23. Penrose, E. (1959). *The Theory of the Growth of the Firm*. London: Basil Blackwell.
24. Porter, M. (1990). *The Competitive Advantage of Nations*. New York: Free Press.
25. Porter, M. (1991). Towards a Dynamic Theory of Strategy. *Strategic Management Journal*, No.12, 95-117.
26. Prahalad, C.K. and Hamel, G. (1990). The Core Competence of the Corporation. *Harvard Business Review* (May-June), Vol.68, No.3, 79-91.
27. Priem, R. and Butler, J. (2001). Is The Resource-Based "View" a Useful Perspective for Strategic Management Research? *The Academy of Management Review*, Vol. 26, 1:22-40.
28. Rumelt, R. (1987). Theory, Strategy, and Entrepreneurship. Chapter 7 in *The Competitive Challenge*, edited by D. Teece. Cambridge: Mass., Ballinguer.
29. Sollow, R. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics*, Vol. 39, 312-320.
30. Teece, D. (1987). Profiting from Technological Innovation: Implications for Integration, Collaboration, and Public Policy. Chapter 9 in *The Competitive Challenge*, edited by D. Teece. Cambridge Mass: Ballinguer.
31. Teece, D. (1988). Technological Change and the Nature of the Firm. In G. Dosei, et al. (eds.) *Technical Change in Economic Theory*.
32. Teece, D., Pisano, G., and Shuen, A. Dynamic capabilities and strategic management. *Strategic Management Journal*, v18, n7 (Aug 1997): 509-533.
33. Wernerfelt, B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal*, No. 5, 171-180.
34. White, (1980). A Heteroskedasticity-consistency Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica*, Vol. 48, 817-838.

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