INTRODUCTION: AN OVERVIEW

In the autumn of 1980, having been granted a year-long leave of absence from Dartmouth College, I arrived in Washington, D.C., at the offices of the United States Federal Trade Commission Line of Business (FTC LB) Program. As a visiting research economist, I was granted access to the program's confidential data describing in unprecedented detail the diversification of the United States' largest manufacturing firms. After roughly a decade of working, first as an in-house economist and then as an outside consultant, with the FTC's remarkable data, I decided to bring together my observations about the FTC LB reporters' diversified activities. This book is the result. In the book, I introduce and apply methodology that discerns groups of manufacturing industries that are related because of complementarities in production, marketing, distribution, and research and development (R&D) activities. Manufacturing firms purposively diversify to exploit such complementarities, and I explore hypotheses about that behavior – i.e., *purposive diversification* – and ensuing economic performance. The book studies product diversification's effects on both static allocative efficiency and the optimality of R&D investment.

The study of those hypotheses about purposive diversification yields new perspectives on the policy debate about cooperation versus competition among firms. The debate is an old one that has flared anew. Chernow (1990, p. 111) gives an interesting perspective on the debate at the beginning of the twentieth century when the firms involved were the railroads, the steelmakers, and the oil refiners. The bankers who arranged the huge combinations of previously competing firms sought to avoid "destructive competition." Now in the century's last decade, the protagonists include manufacturers of high-technology products such as semiconductors and high-definition television. The industrialists and government officials who espouse combinations seek global competitiveness. Will industrial

performance be better if leading firms cooperate on research, production, and marketing? The earlier debate shaped industrial structure and performance throughout the century, and the current debate will be no less important. I hope my observations contribute to an informed discussion of the relative merits of cooperation and competition.

The book is divided into four parts. In Part I, "Static Efficiency and the Diversified Firm," Chapter 1 discusses the nature of the multimarket firm and discusses motives for diversification. The chapter illustrates methodology to be used throughout the book by demonstrating that the leading manufacturers comprising the FTC LB sample purposively combine business units (also referred to as lines of business, or LBs) that share distribution channels. Thus, my methodology is first illustrated with a familiar idea: Economies of scope occur when the distribution systems for different products can share common assets. But another explanation for multimarket firms is that in their diversification the firms are seeking market power. Chapter 2 discusses theories that link diversification and ensuing multimarket contact to market power. Chapter 3 observes that if the hypothesis that multimarket contact increases market power is true, we should see firms seeking to increase multimarket contact with their mergers. The chapter then considers some evidence about such behavior.

This book introduces the idea that nonrandom coincidence of the diversified activities of manufacturers can be used to discern the underlying structure of related or close industry categories and to test hypotheses about industry behavior and performance. Chapter 4 uses the idea to show how the multimarket contact that results from firms' diversification affects resource allocation. The chapter provides evidence that for industries with high seller concentration, greater multimarket contact of their firms is associated with higher profit rates, yet in industries with less concentrated structures, profitability is lowest when multimarket contact is greatest. The chapter develops contrasting possibilities: Multimarket contact can enhance oligopolists' ability to limit production and establish supracompetitive prices, yet it can coincide with especially rapid resource flows that eliminate short-run profits in the less concentrated markets of diversified firms.

Scholars analyzing business strategy have observed that acquisitions diversifying into related industries are valued more highly by the stock market than are unrelated diversifying acquisitions; Singh and Montgomery (1987) provide important verification. Throughout this book, I introduce methodology that discerns related from unrelated groups of industry categories and show, among other things, that the performance implications of related diversification will depend on structural attributes of the industry categories involved. A firm undertaking purposive diversification

will ideally seek not simply related activities, but rather related activities with conditions – such as limited competition and barriers to entry – allowing what Porter (1985) terms sustainable competitive advantage.

The hypothesis that multimarket contact can increase profitability in concentrated industries can be extended. One might hypothesize that multimarket contact is a sine qua non of successful tacit collusion among diversified manufacturers. Chapter 5 explores that hypothesis using the now classic data on U.S. manufacturing in the 1950s. The results do support the hypothesis and are consistent with the findings from the FTC LB data of the mid-1970s. In all, purposive diversification and ensuing multimarket contact, at first blush seemingly of second-order importance for the traditional resource allocation problem at the heart of industrial economics, turn out to be the keys that unlock secrets of behavior and allocative performance for diversified manufacturers.

Further, purposive diversification may drive successful technological advance. Technological successes of the Japanese have been attributed to the "fusion" of ideas generated in different but complementary industries. The technological fusion is made possible by *keiretsu,* or families of firms with ownership interests in one another (*The Economist,* 1989, pp. 5–6; Aoki, 1988, p. 250). Odagiri (1992) provides a detailed description of the various forms for *keiretsu* and other business groups in Japan, and he also observes that the *keiretsu* serve to combine complementary R&D activities (1992, pp. 98–99, p. 161). The *keiretsu* clearly effect a kind of purposive diversification of R&D. Indeed, Porter (1990) has attributed the sustainable competitive advantages of entire countries to their prowess in clusters of related industries. As documented in Part IV, public policy in the United States has moved toward promoting cooperation among firms as a means to effectively cluster complementary resources. Yet there is also a perception that the *keiretsu* linking operations in complementary industry categories may violate U.S. antitrust laws. Holstein et al. (1990, p. 107) describe that perception and note that the U.S. House Judiciary Committee asked the FTC to investigate the effects of *keiretsu* that have operations in the United States. Throughout the book I shall address the static and dynamic performance implications of diversification and cooperation; then, in the Afterword, I shall use my findings to address directly the issues that *keiretsu* have raised about private business strategy and public policy.

The book explores the implications of diversification and cooperation for technological advance and productivity as well as for static allocative and technical efficiency; however, first, it explains the need for such exploration. To do that, Part II, "Firm and Industry Effects versus Traditional Models," explores the explanatory power of simple traditional

models of structure and performance that do not focus on multimarket strategies. Our initial observations in Part I that diversification and the multimarket contact resulting from diversification affect importantly the behavior of firms – together with the fact to be developed in Part III that firms within the same industry category often belong to very different multimarket groups – imply that we should find strong company effects in addition to traditional industry effects in the general linear model of business unit performance. Part II explores the extent of such company effects (also called firm effects) and observes that traditional industrial organization models explain a relatively small part of the systematic variance in LB behavior and performance. The presence of strong company effects and different patterns of multimarket operation for the firms in any particular industry category fit nicely with the Milgrom and Roberts (1990) prediction that complementarities in the production, marketing, engineering, and organizational operations of multiproduct firms will lead to a heterogeneous mix of firms with distinct clusters of characteristics.

Chapter 6 uses fixed effects to control for, among other things, differences in capital costs specific to firms and the industries in which they operate. The chapter shows that traditional structural models of concentration and barriers to entry explain only a small portion of the *systematic* variance in profitability across firms and industries. Industries and firms differ significantly, but our traditional models do not explain much of those systematic differences. There is also evidence that in the mid-1970s difficulties for capital-intensive firms undermined the traditional positive association between seller concentration and profit rates.

Chapter 7 shows that the failure of simple, traditional structural models to explain systematic differences among firms and industries obtains for R&D intensity as well as for profits. The chapter develops – with firm effects as well as the more conventional industry effects – the long-standing hypothesis that technological opportunity is far more important for understanding variance in innovative activity than are measures of rivalry. That hypothesis has found wide support beginning with Scherer's pioneering observations (1965, 1967a). Geroski (1990; 1991a, chapter 6) has supported the hypothesis using data on major innovations in the United Kingdom for the 1970s, the time period from which my United States observations were taken. Yet, in Part III, I shall hypothesize that desirable rivalry is at the heart of the substantial differences in behavior captured by firm effects. The evidence presented provides some support for the hypothesis. Rivalry stimulates diversity in research strategies, and purposive diversification effects that diversity and thereby leads to productivity growth.

The results in Part II demonstrate unequivocally that a firm's performance is not solely determined by the attributes of the industries in which it operates. By using appropriate strategies, a firm can perform better than would be predicted from the firm's set of industries. Executives are taught that differentiating business strategies can advantageously set their firms apart from the pack (see Oster, 1990, and Porter, 1985). The importance of firm effects, as shown in Part II, suggests that indeed the firm's strategies do distinguish it from others in the same industry categories. Further, evidence from several countries suggests that such distinct performance persists – there are permanent differences in profitability across firms (Mueller, 1990).

After Chapter 8 begins with a theory of R&D rivalry that provides an analytical framework for both Part III and Part IV, Part III, "Dynamic Efficiency and the Diversified Firm," explores the pronounced differences in operations among firms in the same industry category. Chapter 9 suggests that the reason for the differences may be the firms' differing patterns of purposive diversification as they seek to exploit synergies in the R&D activities of different industry categories. Indeed, after reviewing conventional studies of diversification and R&D, Scherer and Ross (1990, p. 659) note that different results are obtained in Scott (1988) when *purposive* diversification is studied. The relation between purposive diversification and R&D activity is the focus of Part III.

General Electric Company, for example, has profited from many well-documented cases of R&D spillovers among its diversified operations in lighting, medical equipment, plastics, power generation, and aircraft engines (Naj, 1990). The methodology in Chapter 9 detects such related, or close, industry categories for the FTC LB sample of manufacturers and demonstrates that the exploitation of complementarities in R&D across close manufacturing categories changes R&D effort and productivity growth. Further, as explained in Chapter 9, the finding of purposive diversification across even the very aggregative two-digit industry categories suggests that there are potential problems with estimations of intraindustry and interindustry spillovers from R&D investment when each firm's R&D investments are assigned to a primary industry category or when firms are not grouped according to their purposive diversification. In any case, my results are quite consistent with the general direction of others looking for evidence of spillovers. Bernstein (1988) and Bernstein and Nadiri (1988a, 1988b) are prominent examples.

Similarly, my findings are consistent with those of Caves and Barton (1990), who find that corporate diversification decreases technical efficiency, and with those of Lichtenberg (1990), who finds that the de-diversification movement of the 1980s increased industrial productivity. At first

blush, their results are different – more diversification is associated with lower productivity. My finding that purposive diversification increases productivity growth is not a contradiction, because the back-to-basics movement of the 1980s reduced the random diversification that had increased with the conglomerate mergers in the 1960s and 1970s and increased the purposive variety. More diversification has led to lower productivity, yet productivity increases with *purposive* diversification.

Chapter 10 asks whether evidence for traditional structural models, found wanting in Chapter 7, can be found if firms are reorganized into groups based on the observed patterns of purposive diversification. Arguably, firms compete, especially in areas of R&D, in multimarket sets of related industry categories. As Chapter 10 shows, the poor explanatory power of the traditional models still obtains despite the reorganization. Yet I shall argue that rivalry among firms is nonetheless a major determinant of R&D behavior and performance. Findings of strong company effects in R&D effort and also differences among an industry's firms in terms of their purposive diversification of R&D suggest that more competition, envisioned as rivalry among larger numbers of firms, may improve dynamic performance because it increases diversity in R&D efforts. Chapter 11 develops that hypothesis; the diversity synonymous with the rivalry in Schumpeter's (1942) creative competition is the chapter's subject. The diversity of R&D effort induced by rivalry may underlie the observation in Acs and Audretsch (1988) that less concentrated industries show better innovative performance than more concentrated industries do.

Part IV, "Industrial Policy," relates the findings about diversified manufacturing firms to the debate about the effects of antitrust policy on technological change and productivity. In the United States, the 1980s brought a surge in advocacy of cooperation among previously competing firms as a way to promote technological progress and international competitiveness. In prominent policy analyses, Jorde and Teece (1988) called for further changes in antitrust law to extend those introduced in the National Cooperative Research Act of 1984 (NCRA), and Baily and Chakrabarti (1988) concluded that joint ventures would increase innovation. Such analyses emphasize the appropriability problems and the wasteful duplication of effort that can result from rivalry.

Chapter 12 uses theory and evidence about the NCRA to question the efficacy of cooperation as a means to innovation and competitiveness. Competitive pressures can drive firms to innovate even though they appropriate smaller portions of their innovations' social benefits. Further, just as flipping additional but identical coins increases the probability of at least one favorable outcome, much of what might appear to be wasteful duplication may in fact provide the numerous research trials needed

to increase the probability of innovation to an appropriate level. And, as Chapter 11 emphasizes, rivalry may increase desirable diversity in R&D effort.

Chapter 13 offers more general perspectives about the shift in antitrust policy that underlies the clamor for more cooperation and less rivalry. The clamor has indeed been great. When in 1984 I tentatively discussed with the U.S. National Science Foundation (NSF) the possibility of a proposal to analyze whether or not the emerging legislation on R&D joint ventures was sensible, the NSF policy analyst helping me advised me to shift the focus of my proposed inquiry because the support for antitrust relief for joint ventures was so great. To highlight that support, he cited a California congressman who for over twenty years had represented the California congressional district containing Silicon Valley, the chairman and chief executive officer of the most prominent R&D joint venture, and the Assistant Attorney General from the U.S. Department of Justice's Antitrust Division. He suggested that rather than asking whether the new law providing such relief made sense, I instead could usefully work on determining guidelines for evaluating the R&D joint ventures formed under the new law. Those ventures, after all, would still be subject to challenge for any antitrust violations they committed, although the new law changed procedure for evaluating potential violations and lessened penalties for violations in order to encourage cooperative ventures.

Perhaps, in the spirit of the NSF policy analyst's suggestions, Chapters 12 and 13 will provide insights which will improve the evaluation of the economic effects of cooperative R&D, whether challenged or not, yet also explain the historical context in which the new law was widely and uncritically accepted. Both houses of the U.S. Congress have prepared extensions, to cover joint production efforts, of the 1984 law about cooperative R&D, and the need for the new laws and the form they should take has been earnestly debated (Brodley, 1990; Jorde and Teece, 1990; Shapiro and Willig, 1990; Adams and Brock, 1991a). Chapters 12 and 13 use my findings about purposive diversification to offer a different perspective on the debate about the effectiveness of joint ventures and also provide some greater appreciation of just how blunt are the policy tools provided by fashionable adjustments to our antitrust laws. Because current policy emphasizes cooperation in order to mitigate risks, achieve economies, lessen wasteful duplication, and appropriate returns, it necessarily sacrifices competition. Thus, Chapter 14 concludes by suggesting an unusual form of taxation that could be used to simulate the desirable effects of competition when actual competition is forgone.

The industrial policy discussed in Part IV has been formulated as a response to the declining effectiveness of U.S. manufacturers in international

trade. In the Afterword, I first observe that my findings about U.S. manufacturers are broadly consistent with and complementary to findings in the literature about the manufacturers of other countries. I then use my findings about the implications of purposive diversification for static and dynamic efficiency to compare the relative success of Japan's manufacturers with what at times has been rather lackluster performance of much of U.S. industry. Interesting points of comparison are provided by the decrease in purposive diversification for the typical U.S. manufacturing firm after World War II as contrasted with Japan's *keiretsu* linking complementary activities, and the recent encouragement of joint venture activity by U.S. firms as contrasted with the more long-standing public policy in Japan through which government nurtures cooperative activity among an industry's competitors. In the Afterword, I use the findings throughout the book to offer straightforward policy prescriptions to improve industrial performance and the performance of a nation's international competitors.

PART I

Static efficiency and the diversified firm

1

The multimarket firm

Large manufacturing firms typically operate in many markets. As a result, when we analyze a market's performance as a function of its structure, we need to consider the diversification of the market's sellers and their multimarket contact. The operations of the typical firm among the largest 1000 U.S. manufacturers span several lines of business. Table 1.1 provides the frequency distribution describing the number of manufacturing lines of business (LBs – an LB is a company's operations in a particular industry) for the 437 companies in the sample used in this chapter.[1] The companies are all among the largest 1000 U.S. manufacturers and comprise the Federal Trade Commission Line of Business (FTC LB) Program sample for 1974. These large companies average a bit under eight manufacturing LBs per company.

Of course, the motives for such diversification are numerous. For just a sampling of the variety of commentary through the years, consider Penrose (1959), Gort (1962), Rumelt (1974), Berry (1975), Mueller (1987), and Montgomery and Wernerfelt (1988). Although random discrepancies in the valuation of assets (Gort, 1969) and the risk aversion of managers (Amihud and Lev, 1981) can motivate pure conglomerate diversification, the purposive pursuit of (private) efficiencies because of complementarities across industry categories motivates "related" diversification. I shall focus on the trade-off that such diversification creates between the possibilities for technical efficiencies and for market power and then investigate the ensuing overall performance effects on static and dynamic efficiency.

I shall explore the causes and effects of diversification. Diversification can yield gains to the firm if it can realize economies of scope that increase

[1] The statistics used in this chapter were first presented in a paper given at the Econometric Society's Winter Meetings in Washington, D.C., 1981.