

THE ECONOMICS OF ENTRY LAGS: A THEORETICAL AND EMPIRICAL OVERVIEW

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I. INTRODUCTION

Entry lags have been in the spotlight for over a decade, primarily in the context of government review of mergers. Under the Department of Justice (DOJ) 1982 Merger Guidelines, and now again under the 1992 Merger Guidelines, timely entry is defined as competitively significant entry that occurs within two years.¹ Because it is often more straightforward to prove that entry will take more than two years than it is to

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We include the following statement at the request of the General Counsel of the Federal Trade Commission:

The tables in this article are based in part on nonpublic data obtained from Federal Trade Commission files. The Commission's General Counsel has authorized publication of such data in aggregated form under Commission Rule 5.12(c), 16 C.F.R. § 5.12(c). The analysis and conclusions presented herein are those of the authors, and do not purport to represent the views of the Commission or of any individual Commissioner:

¹ 1982 Merger Guidelines § III B, *reprinted at* 4 Trade Reg. Rep. (CCH) ¶ 13,103; 1992 Merger Guidelines § 3.2, *reprinted at* 4 Trade Reg. Rep. (CCH) ¶ 13,104.

The antitrust agencies require that entry occur "within two years from initial planning to significant market impact" before they will conclude that entry is sufficiently timely that market participants will not be able to exercise market power.

The 1992 Guidelines allow some modification of the two-year period when the relevant product is a durable good and consumers can "defer purchases by making additional investments to extend the useful life of previously purchased goods." When this is the case, "The Agency will consider entry to be timely so long as it would deter or counteract the competitive effect of concern within the two-year period and subsequently." Entry lags also play a role in the Agencies' analysis of participants in the product market. As described in § 1.32 of the 1992 Guidelines, firms that could supply the market within one year and without significant sunk costs investments are considered to be participants in the market already.

Case law has also recognized that entry lags are an important structural characteristic of markets. In some cases, they are termed "entry impediments," that is, "any condition that necessarily delays entry into a market for a significant period of time and thus allows market power to be exercised in the interim." See *Echlin Mfg. Co.*, 105 F.T.C. 410, 486 (1985); *B.F. Goodrich*, 110 F.T.C. 207, 297 (1988); *Weyerhaeuser Co.*, 106 F.T.C. 172, 286-87 (1985).

establish that entry barriers deter entry in the long run, DOJ and Federal Trade Commission (FTC) investigations of entry conditions often focus almost exclusively on the time it takes to enter a market.

While the analysis of entry lags has come to the fore through its application in merger cases, the study of entry lags can be expected to become increasingly important in nonmerger antitrust cases as well. After all, the examination of entry conditions is a crucial part of any antitrust analysis of market power.

More specifically, entry lags should receive increased attention in cases, such as predation cases, where it is crucial to identify the strategic options open to entering firms and potential entrants. For example, a careful analysis of entry lags may be crucial to the determination of whether it is credible to allege that a firm undertook a particular predatory strategy.

Despite the actual and potential importance of entry lags to antitrust cases, economists have devoted relatively little time to the analysis of this market attribute.² In this article, we attempt to provide an introductory overview of the theoretical and empirical underpinnings of entry lag analysis by focusing on three questions: How are entry lags related to entry barriers? What market characteristics and firm strategies determine the time that it takes to enter? How do entry lags actually vary across real-world industries?

To answer each of these three questions, a clear understanding of how to measure an entry lag is needed. Section II of this article describes the approach used here, which is the approach recommended in the 1992 Merger Guidelines.

Section III addresses the question of how entry lags are related to barriers to entry. Our work leads us to believe that market characteristics that slow entry may play a role in raising barriers to entry that may deter entry over the long term. Long entry lags can raise entry barriers either by creating differences in the costs that potential entrants face or by making incumbents' entry-deterring strategies credible.

Section IV discusses firm and market characteristics that determine the length of entry lags and the costs associated with accelerating entry. As is explained more fully in Section IV, the length of the entry period will vary across industries because the assets and know-how that are needed to enter different markets vary. While this observation is fairly

² There are some pre-1982 mentions of lags such as JOE S. BAIN, *INDUSTRIAL ORGANIZATION* 273-75 (2d ed., 1968); RICHARD POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* 57-59 (1976); Darius Gaskins, *Dynamic Limit Pricing: Optimal Pricing Under Threat of Entry*, 31 *J. ECON. THEORY* 22, 31 (1971).

straightforward, it also implies that entry lags will typically vary across different firms that are potential entrants into a given industry.

Section V shows how entry lags actually vary across different industries. Entry lags are estimated in two ways in Section V: first, using a shortcut method that employs public data, and second, entry lag estimates are extracted from court decisions and confidential FTC studies that were done as part of FTC merger investigations. The two sets of estimates correspond closely in most instances. Analysis of the entry lag data also suggests that the antitrust agencies' use of a two-year entry lag standard will not lead them to dismiss merger investigations against large numbers of firms, since there are significant numbers of industries where it is likely to take longer than two years to enter.

Before going to the discussions of our three questions, however, we first need to clarify terms.

II. DEFINITION AND MEASUREMENT DIFFICULTIES

The term "entry lag" could be defined as the period between the time when a monopolistic price increase is implemented and the time when profitable price constraining entry has been completed.³ While this definition appears straightforward and corresponds to the duration of market power that is the basis of economic concern about mergers, the implementation of this definition leads to some difficulty, since it is often hard to determine exactly when the entry period begins and when it ends.

With respect to the beginning of the entry period, it is often difficult to determine how long it will take a likely potential entrant to recognize that an entry opportunity has arisen because of a monopolistic price increase. Because of the difficulties in measuring the lag between the monopolistic price increase and the entrant's recognition that such a price increase has taken place and because this recognition lag is often short, it is often assumed that the entry period starts when the price

³ There are several related, but different, definitions, for example: (1) the time from the entry decision to initial production; (2) the time between the price increase that elicits entry and effective, price constraining entry begins; and (3) the time between the first sizable entry expenditure and effective entry.

Usually, economists are primarily interested in the entry barriers and lags faced by the best-positioned potential entrant. However, an understanding of the positions of other potential entrants is also helpful because the probability that at least one firm will actually enter is typically greater if there are several well-positioned potential entrants. This generalization assumes that increasing the number of potential entrants does not itself reduce the anticipated post-entry price for entrants. If it does, more potential entrants can have the opposite effect. See Roger Sherman & Thomas D. Willett, *Potential Entrants Discourage Entry*, 75 J. POL. ECON. 400 (1967).

increase starts and that this coincides with the initial planning for entry.⁴ Indeed, this is what the DOJ and FTC assume in their Merger Guidelines.⁵

The definition of "the conclusion of the entry period" is complicated by the fact that an entrant may have a price constraining effect on the market either long after or before it has begun producing and/or selling its first unit of output.⁶ In some markets, entrants have to build up a reputation for product quality, reliable delivery, and service before they have a significant impact on the pricing of other firms in the market, which can extend the entry period well past the time when the entrant produces and/or sells its first unit of output. In other markets, entrants can successfully compete for orders before they have completed their production facilities. In some markets it is also possible for consumers to delay purchases until the entrant's facilities are completed. In these latter cases, entrants can have significant impacts on market prices before they are capable of producing any output.⁷ As a result, the investigation of entry lags will often have to involve an analysis of the factors that custom-

⁴ The possibility that recognition lags may be present was noted by Adam Smith: "If the market is at a great distance from residences of those who supply it, they may sometimes be able to keep the secret for several years together, and may so long enjoy their extraordinary profits without any new rivals." ADAM SMITH, *WEALTH OF NATIONS* 60 (Modern Library ed. 1937). He continued by noting that recognition lags are likely to be short.

⁵ This appears to be the definition adopted in the 1992 Guidelines, since "the Agency will consider timely only those committed entry alternatives that can be achieved within two years from initial planning to significant market impact." The 1982 DOJ Guidelines also assumed no recognition lag for both product market definition and the evaluation of the ease of entry (see 1982 Guidelines n.10 and references in nn.8 & 34). "If you look at footnote 10 of the 1982 Guidelines . . . you will see that the second paragraph includes an assumption about the recognition of a price increase and about its likely duration. We have thus assumed away the first lag that you mentioned . . . we ultimately concluded that it was the only way to establish anything like a consistent pattern of applying the standards on the Guidelines." Letter from Tyler A. Baker, a major contributor to the 1982 DOJ Guidelines, to Alan Fisher (Sept. 14, 1982) (personal correspondence of Alan Fisher).

The inclusion of a recognition lag may lead to an increase or decrease in the length of the entry lag. When entrants do not perceive the price increase right away, entry may take longer than one would predict if one ignores the recognition lag. On the other hand, when established firms announce price increases in advance of when they actually start selling at the new price, entrants can react to a price increase before it actually happens, so the period of high prices may be shorter than the time it takes to enter.

⁶ The Merger Guidelines discuss the need for the entrant to have a price constraining effect on the market in terms of the "sufficiency" of entry. For a case recognizing the concept of effective or sufficient entry, see *Coca-Cola Bottling Co. of New York*, 93 F.T.C. 110, 210 n.13 (1979).

⁷ Often a firm must start production before its entry has significant price effects. This need not be the case, however. In some markets, for example, orders are taken before production begins. In this case, a firm that is a credible manufacturer that has started to enter may compete for contracts before it has produced a single product.

ers consider when making an order and the willingness and ability of consumers to delay purchases so that they can buy from an entrant.⁸

In measuring the length of the entry lag, one must also recognize that the length of the entry period often can be shortened through the expenditure of additional resources. For example, by working overtime it may be possible to accelerate the construction of assets that are needed to support entry. However, because it is costly to accelerate entry, it often is not profitable to shorten entry lags significantly, even when it is technically feasible. Nonetheless, in measuring the length of an entry lag, it is important to identify accelerated entry strategies when these strategies cost-effectively secure higher post-entry prices and, as a result, are profitable.⁹

III. THEORETICAL FOUNDATIONS FOR USE OF ENTRY LAGS IN ANTITRUST ANALYSIS

Why should antitrust authorities be concerned with entry lags? One reason is that entry lags may allow established firms to profitably raise prices above competitive levels for a substantial period of time before entry forces prices back to competitive levels.¹⁰ A social loss and transfer of wealth away from consumers will result from higher prices and lower production during the lag before effective entry. Moreover, the private gains that result from the price increase may encourage entry, despite excess capacity among incumbents.¹¹ The introduction of this additional

⁸ This approach has been adopted in the 1992 Merger Guidelines § 3.2.

⁹ The Merger Guidelines address whether entry is "likely," which is defined in terms of the profitability of entry. As a result, while the Guidelines are not explicit, it appears that they measure the entry lag as the shortest time period over which profitable entry could occur. This consideration is complicated by the further recognition that faster, higher cost entry entails greater risk. Risk stems, for example, from increased likelihood of costly errors in equipment installation or increased vulnerability to post-entry pricing strategies of incumbents or subsequent entrants.

¹⁰ Excess returns appear to disappear more slowly where real resources are not mobile. See, e.g., Steven H. Lustgarten & Stavros B. Thomadakis, *Valuation Response to New Information: A Test of Resource Mobility and Market Structure*, 88 J. POL. ECON. 977 (1980). For a general review of persistence of profit evidence, see DENNIS C. MUELLER, *THE DETERMINANTS OF PERSISTENT PROFITS: AN EMPIRICAL STUDY* (Report to the FTC Bureau of Economics 1983).

¹¹ The issue of whether entry will result when prices are raised above the entrant's costs depends to a large extent on the entrant's perception of the established firms' responses to its entry. For established firms, the attractiveness of raising prices depends on post-entry profits (or losses), which depend on the firms' strategic responses to post-entry surplus capacity. See Steven C. Salop, *Strategic Entry Deterrence*, 69 AM. ECON. REV. 335 (1979); Gaskins, *supra* note 2 (discussing why an established firm might increase price even though entry will follow). In addition, Gaskins's findings suggest that entry lags may lead to a higher price path for the limit pricing monopolist. See also Paul Milgrom & John Roberts, *Limit Pricing and Entry Under Incomplete Information: An Equilibrium Analysis*, 50 *ECONOMICA*

capacity, when there is already excess capacity, may lead to additional social losses.¹²

While it is the social losses accompanying transitory monopolistic pricing that have historically concerned antitrust authorities,¹³ there are other antitrust concerns raised by the presence of entry lags. Specifically, entry lags may contribute to the creation of entry barriers.

We have identified three circumstances when the presence of entry lags may lead to asymmetries between incumbent firms and potential entrants that deter entry: (1) when entry lags increase over time and entry costs per unit of time do not change, today's potential entrant may face higher entry costs than incumbents faced when they entered; (2) when entry lags are long and sunk costs are a function of the length of the entry period, entrants may face sizeable sunk costs that can deter entry; and (3) when entry lags are long and cannot be shortened cost effectively, incumbents may have credible strategic responses that can deter entry.

A. ENTRY DETERRENCE: CHANGES IN ENTRY COSTS DUE TO CHANGES IN ENTRY LAGS

As the proverb puts it, "time is money." Several examples will suggest why entry costs tend to rise with the length of the entry lag. First, the salaries of key employees and other firm operating costs must be paid throughout the entire entry period, causing total firm expenses to rise with the length of the entry period. Second, deposits on equipment and other capital expenditures often have to be made early in the entry period. When the time-value of money is recognized, this implies that the investment required to enter a market will increase with increases in entry lags. Finally, longer entry lags involve increased risk that external shocks will occur. Some potentially significant shocks could include recession, shifts in exchange rates or interest rates, strikes, new technology,

443 (1982) and *Predation, Reputation and Entry Deterrence*, 27 J. ECON. THEORY 280 (1982). See generally JEAN TIROLE, *THE THEORY OF INDUSTRIAL ORGANIZATION* ch. 9 (1988).

¹² We are not advocating any restrictions on such entry, merely noting the possibility. For a review of the extremely limited circumstances where efficiency, at least in the static sense, might be enhanced by entry restrictions, see WILLIAM BAUMOL, JOHN PANZAR & ROBERT WILLIG, *CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE* (1982); WILLIAM SHARKEY, *THE THEORY OF NATURAL MONOPOLY* (1982). A brief summary of this material is presented in John C. Hilke & Michael Vita, *Comments of the Staff of the Bureau of Economics of the Federal Trade Commission, in MONOPOLY THEORY INQUIRY*, DOCKET NO. RM89-4, at 119-37 (U.S. Postal Rate Commission, 1989).

¹³ For example, the 1992 Merger Guidelines express the concern that the presence of significant entry lags will sufficiently insulate merging firms from competition that "entry will not deter or counteract the competitive effect of concern." 1992 Merger Guidelines § 3.0.

bankruptcy of suppliers, weather damage or vandalism to equipment during construction, and regulatory changes. Increased risk is equivalent to an increase in cost in the usual risk-return framework of investment decisions.

This analysis of the connection between costs and entry lags suggests that the total costs associated with entry will be higher if the entry period is longer, since entry costs per unit of time are unlikely to fall by enough to compensate. Moreover, when entry lags are long, the recoupment of any introductory losses (or investments) are postponed for a considerable period, causing the present value of preentry losses at the time entry is completed to rise. As a result, entry costs are likely to be higher where entry periods are longer.

Since the length of the entry period depends on changing market forces, today's potential entrant may face a very different environment than established firms faced when they entered. To the extent that today's potential entrant faces longer entry lags than established firms did, today's potential entry may face a barrier to entry, since the potential entrant's entry costs may exceed the incumbents' entry costs.¹⁴ This follows from the fact that the increase in the cost of entry can be viewed as an entry fee that today's entrants must pay, but that established firms did not have to pay. Since entrants must be able to charge prices that would allow them to recoup this entry fee, they can only survive at prices that exceed the costs of established firms. As a result, a conspiracy (or merger) among established firms may raise prices above incumbent firms' costs and lead to underutilization of established firms' assets.

While the presence of long entry lags does not imply that there has been a change in entry lags, a short entry period does indicate that there cannot have been a significant increase in the entry period. As a result, a long entry lag is a necessary condition for a change in entry lags to raise barriers to entry. Students of an industry can use the presence of long entry lags as a signal to consider investigating changes in entry lags as potential sources of entry barriers.

B. ENTRY DETERRENCE: LONG ENTRY LAGS CAN BE SYMPTOMATIC OF HIGH SUNK COSTS AND HIGH MINIMUM EFFICIENT SCALE

Long entry lags are sometimes present because the entering firm needs time to build its reputation as a quality supplier, recruit employees,

¹⁴ Changes in market conditions leading to changes in entry lags are discussed in the next section. For another brief discussion of some of the factors that may change over time and alter the effectiveness of entry strategies and thus the length of the entry period, see Michael E. Porter, *The Structure Within Industries and Companies' Performance*, 61 *REV. ECON. & STAT.* (1979). See generally F. M. SCHERER & DAVID ROSS, *INDUSTRIAL MARKET STRUCTURE*

meet regulatory requirements, obtain capital, set up and fine-tune the organizational structure, and contact potential customers. Such time consuming activities prior to production can reflect investments in intangible assets which are unlikely to be recouped if the entry effort fails.¹⁵ When there are long entry lags due to these activities, the magnitude of these unrecoverable costs can be large, increasing the riskiness of entry.¹⁶ Further, when these costs are large they may also cause minimum efficient scale to be high relative to market demand. If so, potential entrants may be deterred from entering because of the large minimum efficient scale and sunk costs. Students of an industry can use the presence of long entry lags as a signal to consider investigating sunk costs associated with the entry lags.

C. ENTRY DETERRENCE: ENTRY LAG EFFECTS ON FIRM STRATEGIES

Entry lags may also deter entry by making certain entry-detering strategies profitable. For example, the length and structure of the entry lag may be important in determining what actions by the entrant are credible (nonreversible) at different points in time. The more time it takes an entrant to become fully committed to the market, the more time established firms have to take actions that will discourage the entrant from entering or alter the way in which the entrant will enter.¹⁷ If entry is quick and irreversible, costs are incurred immediately, and incumbents will find that many strategic options have been foreclosed. Moreover, as suggested above, when long entry periods signify sizeable sunk costs,

AND ECONOMIC PERFORMANCE 391-407 (3d ed. 1990).

Stigler appears to have recognized this potential asymmetry when he wrote that, "these costs of building up a going business are legitimate investment expenses, and, *unless historical change takes place in the market*, must be equal for both established and new firms." GEORGE J. STIGLER, *THE ORGANIZATION OF INDUSTRY* 99-100 (1968) (emphasis added).

¹⁵ The 1992 Merger Guidelines evidence particular concern about "sunk costs." Indeed, the 1992 Guidelines focus only on "committed entry," which is defined as "new competition that requires expenditure of significant sunk costs of entry and exit." Uncommitted entry is generally treated under market definition. At § 1.32, the 1992 Guidelines do exclude from the market definition analysis uncommitted supply that is subject to long delays, indicating that such supply should be considered within the entry analysis, i.e., under a two-year time limit.

¹⁶ To some extent, the entrants' losses during the entry period are due to the presence of established firms that constrain prices in a way in which they were not constrained at the time the first firms entered the industry.

¹⁷ For a discussion of how the speed with which firms can grow can affect their ability to make preemptive investments, see A. Michael Spence, *Investment Strategy and Growth in a New Market*, 10 *BELL J. ECON.* 1 (1979). The 1992 Merger Guidelines express some concern for strategic responses by incumbents, noting that "anticipated sales expansion by incumbents in reaction to entry, either generalized or targeted at customers approached by the entrant that utilizes prior irreversible investment in excess of production capacity" may reduce entrants' sales opportunities and thus discourage entry.

entry lags may enable established firms to adopt strategies that cause entrants to alter their entry strategies, perhaps leading to exit or to entry into a different market niche that is less threatening to the incumbents' profitability.¹⁸ Students of an industry may use the presence of entry lags as a signal to consider investigating strategic behavior by incumbent firms.

IV. MARKET AND FIRM CHARACTERISTICS THAT DETERMINE THE LENGTH OF ENTRY LAGS

Entry lags vary across markets and firms.¹⁹ In this section, we identify market and firm characteristics that affect the length of entry lags and describe how changes in market characteristics can cause the time needed to enter a market to change, without causing the cost per unit of time to change. We focus on eight aspects of a market that may affect the length of entry lags: (1) assets of potential entrants; (2) assets needed to enter; (3) geographic scope of entry; (4) range of products needed for entry; (5) nature of demand; (6) interest rates; (7) established firms' assets; and (8) responses to entry by established firms.

A. ASSETS OF POTENTIAL ENTRANTS

Firms have different histories, which means that they have accumulated stocks of different tangible and intangible assets. For some firms, only minimal new investment may be necessary to enter a particular market, since they already have the distribution arrangements, reputation, and capital equipment needed to enter the market. Other firms may require substantially more time before they can enter.²⁰

When analyzing how entry lags will vary across firms, it is important to identify both what must be done to enter and what the potential entrant has already done. For example, firms in neighboring geographic markets may be particularly well positioned for rapid entry, if the acquisi-

¹⁸ See, e.g., John C. Hilke & Philip B. Nelson, *Caveat Innovator: Strategic and Structural Characteristics of New Product Introductions*, 8 J. ECON. BEHAV. & ORG. 213 (1987) and references therein. See also William S. Comanor & H.E. Frech III, *Strategic Behavior and Antitrust Analysis*, 74 AM. ECON. REV. 372 (1984).

¹⁹ Posner, *supra* note 2, at 58.

The optimum delay [in entry] will depend in part on the rate at which cost falls with delay, and one imagines that the rate will be higher for more complicated production processes. That is presumably why U.S. Steel's monopoly position was not instantaneously eliminated by the entry of new firms or the expansion of existing ones: the cost of quickly creating, or rapidly expanding a complex enterprise such as steel production is prohibitively high.

²⁰ Joe Bain recognized that there may be a queue of potential entrants arranged in order of "increasing disadvantage." BAIN, *supra* note 2, at 254.

tion of production assets is the most time-consuming entry requirement.²¹ However, if the development of a brand name or a reputation is key, firms that already supply related products to the customers in the relevant geographic market may be the best-positioned entrants, since they may be able to use their established customer relationships to support entry.

The assets that potential entrants have at their disposal can change over time, which means that today's best-positioned potential entrant may face a longer or shorter entry lag than incumbent firms faced when they entered. For example, today's potential entrants will have more ready access to needed know-how than incumbents had, if the know-how has become public knowledge over time.²² Alternatively, today's potential entrant may face a longer entry lag if the entrant does not have access to the same quality inputs as the incumbents did when they entered because the incumbents have tied up these essential assets.²³

B. TYPES OF ASSETS NEEDED TO ENTER

Both the physical assets and intangible assets, such as "know-how" and "firm reputation," that are needed to compete effectively in a market vary across markets. While some markets require almost no assets to enter, other markets require substantial assets. Since it takes more time to acquire some types of assets than other types of assets, entry lags will vary across markets. Entry lags will also vary across markets because the amount of time that it takes a firm to develop a customer base that will allow it to operate its assets efficiently varies across markets.

Variations in the time required to build large scale physical assets have been recognized as one factor that affects entry requirements,²⁴ but there are others. For example, the need to develop a reputation for providing a quality product and associated services may determine the length of the entry period. For experience goods,²⁵ the entrant will need time to

²¹ Indeed, the best-positioned firm may be a producer in another country. For a discussion of the factors affecting entry by foreign firms, see Louis Esposito & Frances F. Esposito, *Foreign Competition and Domestic Industry Profitability*, 53 REV. ECON. & STAT. 343 (1971); and George Hay, John C. Hilke & Philip B. Nelson, *Geographic Market Definition in an International Context*, 64 CHI.-KENT L. REV. 711 (1988).

²² See Amihai Glazer, *The Advantages of Being First*, 75 AM. ECON. REV. 473 (1985).

²³ This type of strategy is at the heart of many raising rivals' costs strategies. For a discussion of raising rivals' costs strategies, see, e.g., Thomas E. Krattenmaker & Steven C. Salop, *Anticompetitive Exclusion: Raising Rivals' Cost to Achieve Power over Price*, 96 YALE L.J. 209 (1986).

²⁴ See, e.g., POSNER, *supra* note 2, at 59.

²⁵ Experience goods are goods that must be purchased and tried before the consumer is aware of the product's quality. See Philip Nelson, *Information and Consumer Behavior*, 78 J. POL. ECON. 311 (1970).

convince consumers about the quality of its product.²⁶ To some extent advertising can accelerate this process by informing consumers directly and serving as a signal. However, product trial and perhaps repeated purchases, may also be needed. In addition, time may be required to reveal the durability of the product. Until the entrant has undertaken these introductory efforts, it cannot be thought of as "in the market."

The assets needed to enter may also depend on the way the firm decides to serve the market. For example, it may be quite easy and quick to enter as a fringe competitor, but much more difficult and time-consuming to enter as a full-line producer.²⁷ Or, it may be relatively easy to enter as a producer of "generic" products, as opposed to specialty products, since one may be able thereby to avoid lengthy information acquisition or the purchase of specialized machinery that delay entry. As a result, entry lags can vary with the type of entry that is being attempted. Since the competitive implications of different types of entry differ, one must be careful to match entry lags with particular types of entry and to realize that different types of entry have different competitive implications.

The assets needed to enter a given market may vary over time. For example, technological innovation may alter the technological know-how that is needed to compete with incumbent firms.²⁸ While the incumbents may have been able to acquire these assets slowly over time, today's potential entrant probably will not have this option because of the change in the incumbent firms' talents over time. As a result, today's potential entrant may face a very different entry lag than incumbent firms faced when they entered, even if today's potential entrant has all of the assets that incumbents had when they entered.

Even if the actual assets required for successful competition in a market do not change, the time required to acquire these assets can change over time. For example, delivery lags for key pieces of equipment may change. These types of changes also imply that the entry lags faced by today's

²⁶ For a model that shows how asymmetrical consumer information about pioneering brands versus entering brands may affect entry, see Cecelia Conrad, *The Advantage of Being First and Competition Between Firms*, 1 INT'L J. INDUS. ORG. 353 (1983).

²⁷ For example, a fringe producer may not require a stable long-run source of supply, since entry costs can be covered during a very short boom in the market. However, larger scale entry may require acquisition of rights to inputs, so that production (needed to cover sizeable sunk costs) can continue in market downturns.

²⁸ Alternatively, technological breakthroughs may alter the optimal scale of operation, which will affect the types of assets that are needed by an entrant and the number of customers that must be obtained to operate efficiently. Both of these changes will affect the time it takes to enter.

potential entrant may differ from those that incumbent firms faced when they entered.

C. GEOGRAPHIC SCOPE OF ENTRY

Entry into a small geographic area will generally take less time than entry into a larger geographic area. As a result, entry lags will typically vary with the size of the area that is being entered. Since markets differ with respect to the minimum size area that it is possible to enter and compete successfully, entry lags will vary across markets.

Because changes in either supply or demand characteristics in a market can alter the geographic area that needs to be entered for an entrant to be successful, the entry lag that today's potential entrant faces may differ from the entry lag that incumbents faced when they entered. For example, a decline in transportation costs may cause the size of the relevant geographic market to increase in size and increase the efficient scale of operation, which may expand the length of entry lags. Similarly, an increase in the cost-effectiveness of national advertising relative to regional advertising may expand the efficient geographic scope of a firm's operation and slow entry.²⁹

D. RANGE OF PRODUCTS NEEDED FOR ENTRY

The development of a narrow product line will generally take less time than the development of a broad product line. As a result, entry lags typically will vary with the size of the product line that must be developed to support successful entry. Since markets differ with respect to the number of products that must be introduced to enter and compete successfully, entry lags will vary across markets.

Over time, changes in supply or demand may alter the optimal product mix for suppliers in a market. Not only can there be a shift in the varieties of a given product demanded, but it may become optimal to produce a complete line of products under the same corporate roof.³⁰ Similarly, it

²⁹ Economies of scale associated with advertising at the national level, rather than using regional spot advertisements to cover the same area, can be substantial. See Saul Levmore, *Small Firm Disadvantages in Television Advertising* (1978) (unpublished Ph.D. dissertation, Yale University); John C. Hilke & Philip B. Nelson, *An Empirical Note from Case Documents on the Economies of Network Television Advertising*, 4 REV. INDUS. ORG. 131 (1989); Michael E. Porter, *Intrabrand Choice, Media Mix, and Market Performance*, 66 AM. ECON. REV. 398 (1976). For a contrasting view based on list prices for advertising, see John Peterman, *Differences Between the Levels of Spot and Network Advertising Rates*, 52 J. BUS. 549 (1979).

For a discussion of strategic difficulties that may be encountered in staged rollouts of new products, see Hilke & Nelson, *supra* note 18.

³⁰ See, e.g., Michael T. Maloney & Robert E. McCormick, *A Theory of Cost and Intermittent Production*, 56 J. BUS. 139 (1983).

may become optimal to vertically integrate either upstream or downstream. As with an expansion in the scope of the geographic market, this broadening of the product mix may complicate entry so that today's potential entrant faces longer entry lags than incumbent firms faced when they entered.

E. NATURE OF DEMAND

In markets where demand is expected to grow faster than supply, potential entrants may find it profitable to accelerate their entry efforts since prices are more likely to exceed long-run marginal costs. The extent to which entry can be accelerated profitably will depend on the extent to which costs increase due to the acceleration of entry. Since simultaneous efforts by numerous parties to enter a growing market may lead to bottlenecks in key input markets or other sources of higher costs,³¹ accelerated entry may be impractical, at least for some entrants.³²

The optimal price responses to an entrant's sales will differ with the cross-elasticity of demand between the firms' products. This will alter the optimal time path of prices (and outputs) for the entrant, and thus the "entry lag." For example, entrants facing more elastic demand curves may find it profitable to delay their initial production relative to firms facing more inelastic demand, especially if they can use the time to complete cost-reducing refinements in the production processes.

Since the location and shape of firm and industry demand curves can change over time, today's potential entrant may face a different entry lag than incumbent firms faced when they entered. For example, entry may take more time for the potential entrant if the presence of established brands makes it harder for the entrant to obtain consumer recognition for its product.

F. ESTABLISHED FIRMS' ASSETS

The characteristics of established firms' assets, such as the time it takes for key pieces of plant and equipment to depreciate, the age of this equipment, scale economies associated with this equipment, and the productive capability of these assets may affect entry lags. The reason is

³¹ For example, equipment maintenance costs might be higher if hasty installation of equipment is associated with more frequent equipment breakdowns.

³² For a discussion of how costs rise with an acceleration of entry, see Armen A. Alchian, *Costs and Outputs*, in *READINGS IN MICROECONOMICS* 159 (William Breit & Harold M. Hochman eds., 2d ed. 1971). At some point, however, the savings from slowed construction stop and may even turn up. *FREDERICK S. MERRITT, BUILDING CONSTRUCTION HANDBOOK* 25-15 (3d ed. 1975).

that the nature of the established firms' assets will help determine the responses of these firms to entry, and thus the entry strategies adopted by potential entrants.³³ For example, if the established firms will encounter diseconomies of scale if they expand output, a lowering of price and expansion of output will be a less credible response to entry than it would be otherwise and more aggressive entry strategies may be attractive. Similarly, if established firms have state-of-the-art assets that can produce the relevant product at low costs, entrants may find it necessary to invest in different assets than they would if the incumbents had chosen to invest in different types of assets.

Because incumbents can change their assets over time, the entry lags that potential entrants face can change as well. This implies that today's potential entrant may face a different entry lag than incumbents faced at the time they entered.

G. RESPONSES OF RIVALS

The profit an entrant expects to earn if it uses a particular entry strategy depends on the demand curve it faces, the quantity it chooses to supply, its costs, and the output supplied by its rivals. Since established firms can influence all of these variables,³⁴ at least indirectly, the optimal entry path can be altered by the actions of established firms. Moreover, changes in the conjectures that potential entrants make about incumbents' strategies will alter entry strategies and entry lags.

Each of the variables that determines the likely responses of incumbents can change over time. As a result, the entry lags that potential entrants face may also change over time.

³³ For discussion of how existing firms can alter the durability of plants that are purchased, as well as the time pattern and level of their investments in plant maintenance to deter entry, see B. Curtis Eaton & Richard G. Lipsey, *Exit Barriers Are Entry Barriers: The Durability of Capital As A Barrier to Entry*, 11 BELL J. ECON. 721 (1980). There is also evidence that, at least in some industries, entry lags may affect investment cycles. See MARGARET E. SLADE, *CYCLES IN NONRENEWABLE NATURAL-RESOURCE COMMODITY PRICES: AN ANALYSIS OF THE FREQUENCY DOMAIN* (FTC Bureau of Economics Working Paper No. 42, 1982).

³⁴ Incumbents can affect both an entrant's demand and costs. For example, the demand for an entrant's product depends, in part, on the output, pricing, and promotional activities of its rivals. An entrant's costs may also depend on incumbent rivals' actions. For example, established firms may find ways to increase the cost of key inputs by creating bottlenecks or regulatory changes which may disproportionately affect entrants that are more dependent on that input than established firms. For a discussion of how rivals' costs may be raised, see Krattenmaker & Salop, *supra* note 23; Steven C. Salop & David T. Scheffman, *Raising Rivals' Costs*, 73 AM. ECON. REV. 267 (1983); Oliver E. Williamson, *Wage Rates as a Barrier To Entry: The Pennington Case*, 82 Q.J. ECON. 85 (1968). Concerning the effects of advertising and promotion in this regard, see Lester G. Telser, *Advertising and Competition*, 72 J. POL. ECON. 537, 555 (1964); John C. Hilke & Philip B. Nelson, *Noisy Advertising and the Predation Rule in Antitrust Analysis*, 74 AM. ECON. REV. 367 (1984); Y. KOTOWITZ & F. MATHEWSON,

V. EMPIRICAL ESTIMATIONS OF ENTRY LAGS

The Merger Guidelines' use of the two-year entry lag standard suggests a key empirical question: How do entry lags vary across different industries? We are unaware of any data describing the length of entry lags in large numbers of different industries. As a result, policy makers may have little basis for assessing the implications of a "two-year standard" relative to some other standard, and practitioners must await detailed interviews with their clients before they can assess the likely length of entry lags (and the government's likely evaluation of entry lags).

The most accurate method of estimating entry lags is to do a detailed case study of a particular market, which identifies the tasks that specific potential entrants must complete before they can have a competitively significant effect on market prices. Indeed, as has been suggested above, this is what the antitrust agencies do on a case-by-case basis for their merger investigations. However, the findings of the antitrust agencies are not public and cover only a limited number of industries.

To provide practitioners and policymakers with a broader view of the variation of entry lags across industries, we have employed two different approaches to obtain estimates of entry lags. One approach employed publicly available data and used engineering estimates that relate entry lags to the size of capital expenditures. The second approach obtained entry lag estimates from confidential FTC studies and court cases. These estimates appear to be based on fairly detailed case studies that were undertaken as part of merger investigations. While confidentiality restraints limit our ability to report detailed findings from the second empirical effort, we have used this information to confirm the reasonable reliability of the engineering estimates which are based on publicly available data.

A. ROUGH ESTIMATES OF CONSTRUCTION LAGS

We propose using a relatively simple, two-step, empirical approach to obtain rough estimates of entry lags. The first step is to determine the size of the minimum efficient scale plant in the industry.³⁵ Rough data on minimum efficient scale are available from the census of manufactur-

PRICE THREATS, ADVERTISING THREATS AND ADVERTISING AS A BARRIER TO ENTRY (Working Paper No. 7811, Institute for Policy Analysis, University of Toronto 1978).

³⁵ The 1992 Merger Guidelines focus on minimum viable scale (MVS), rather than minimum efficient scale (MES). See 1992 Guidelines n.31. Since public data on MVS are not available, we use MES. As a general proposition, MVS will be smaller than MES. The degree of difference will depend on the premerger price levels and the shape of the cost function.

ers. The second step is to use engineering estimates of construction lags to calculate how long it is likely to take to build a plant of that size. Engineering estimates of construction lags for various sized projects are publicly available. Each step is detailed below.

It should be emphasized that this process produces only a rough estimate of the minimum time needed to construct an efficient plant in the relevant market. Using census-defined industry data of this sort will often require using an overly broad (or occasionally too narrow) market definition. To the extent that technology differs between relevant markets within a census category, the census-based data will be off the mark for specific markets. Moreover, as discussed earlier, construction lags may understate entry lags when there are additional entry hurdles. Conversely, construction lags may overstate the entry period when firms can enter by simply modifying existing structures or when they can contract with customers before they have completed their production facility. Nonetheless, the time needed to construct a new plant is a basic entry statistic that is likely to be important in many cases and is a helpful first empirical step toward analyzing entry lags generally.

Table 1 contains two lag estimates for several industry groups along with minimum optimum scale estimates for each. The industry groups listed in Table 1 are simply the first available listings under each major industry group. A more extensive list covering 200 industry groupings is available from the authors.

The minimum optimum scale in this instance is calculated from 1972 Census of Manufacturing data and the FTC's Line of Business data set from 1976. A market share estimate for the minimum efficient size plant is derived from the plant level *census* data. The MES plant measure used is the "average plant size among the largest plants accounting for half of industry output" expressed as a proportion of industry output. The market share estimates of a minimum efficient scale plant are then multiplied by the Total Assets associated with that industry group in the 1976 FTC Line of Business data to obtain the cost of a minimum efficient scale plant.³⁶

³⁶ The census estimates were supplied by George Pascoe, an FTC employee, and utilize the "midpoint plant" measure, that is, the average sales of plants accounting for the top 50% of sales in the 1972 Census. The Line of Business assets figures were produced by dividing the assets reported by LB sample companies by the participation ratio for that industry group. For example, if the assets reported for industry A were \$10 million and the participation ratio (LB sample/whole industry) were 50%, then the assets for industry A would be \$20 million. If the MES plant's market share was then 5%, the MES plant's estimates-cost would be \$1 million.

The two data bases are generally compatible. The Line of Business industry groups consist of one or more SIC 4-digit industries. Where the Line of Business definition

Table 1
Estimated MES and Construction-Related Entry Lags

L.O.B.	Description	Minimum Invest. (\$ ml.)	Const. Lag (mo.)	Total Lag (mo.)
20.01	Meat Packing	31.6	20	26
21.01	Cigarettes	757.8	30	36+
22.03	Narrow Fabric Mills	3.8	<13	20
23.01	Males' Suits and Coats	7.3	13	20
24.03	Millwork and Plywood	34.2	20	26
25.03	Office Furniture	36.9	20	26
26.01	Pulp Mills	151.6	30	36+
27.01	Newspapers	37.0	20	26
28.01	Industrial Gases	6.2	13	20
29.01	Petroleum Refining	434.1	30	36+
30.01	Tires and Inner Tubes	115.7	30	36+
31.01	Leather Tanning and Finishing	5.5	13	20
32.01	Flat Glass	119.1	30	36+
33.01	Blast Furnace and Basic Steel Production	566.6	30	36+
34.01	Metal Cans	20.6	18	24
35.01	Turbines and Turbine Generators	115.4	30	36+
36.01	Transformers	39.1	20	26
37.01	Passenger Cars	245.7	30	36+
38.01	Engineering and Scientific Instruments	15.0	15	20
39.01	Jewelry, Silverware, and Plated Ware	32.9	20	26

The minimum capital investment figures were then compared to a table of construction lags to obtain the Construction Lag data in Table 1.³⁷ The Construction Lag reflects only the time necessary to build the plant while the Total Lag figures include the time needed to design, as well as build, the plant.

encompasses more than one SIC industry, the market share of the MES plant used in calculating the assets needed to build an MES plant is an average of the component 4-digit MES market share ratios.

MES measures of this type are commonly employed in industrial organization research. See, e.g., WILLIAM COMANOR, & THOMAS WILSON, *ADVERTISING AND MARKET POWER* 135-36 (1974); Peter F. CORY, *A Technique for Obtaining Improved Proxy Estimates of Minimum Optimal Scale*, 63 REV. ECON. & STAT. 96 (1981); and more generally, SCHERER & ROSS, at 424-30 (1990).

³⁷ MERRITT, *supra* note 32, at 25-13 through 25-16.

As with the Merger Guidelines, these delay estimates contain no recognition lags. They also assume that only construction of production facilities will delay entry, which may be incorrect in some situations.³⁸

The results displayed in Table 1, and in the broader table from which it was excerpted, indicate that there are many industry groups that require more than two years for the construction of new plants. Indeed, more than two-thirds of the industries reported in Table 1 and the underlying table have total lags of two years or longer.³⁹ As a result, there may be many industries that are eligible for classification as industries where de novo entry is "difficult."

At the same time, it must be remembered that entry may not require the construction of new facilities. Perhaps more importantly, the plants of existing fringe competitors might be more readily expandable or plants that produce similar products may be able to be modified to produce the product that is the focus of the merger.

B. COMPARISON TO LAGS FOUND IN INVESTIGATIONS AND LITIGATED CASES

Table 2 compares our rough entry lag estimates with entry lag estimates that were made by FTC staff or the courts during their merger reviews.⁴⁰ Because the entry lag estimates from the FTC files incorporate confidential data and are themselves confidential work product of FTC staff, more

³⁸ As was pointed out earlier, rushing the construction schedule often results in higher costs which could put the entrant at a long-term cost disadvantage. For some estimates of these costs, see MERRITT, *supra* note 32.

³⁹ The range of lag predictions is considerably more truncated than the minimum capital investment estimates because of lumpiness in the informal guideline used in estimating construction lags. Whether this truncation is appropriate or not deserves consideration, but from the antitrust practitioners' perspective, the 36-month upper bound is sufficient to invoke the two-year criteria in the Justice Department Guidelines for de novo new capacity entry.

⁴⁰ The listing of investigations and cases reported in the tables published here carry no known biases, but it is not a classic randomly selected sample. The confidential FTC case memoranda reviewed included all investigation memoranda retained in the Bureau of Economics division files as of early 1982 and included investigations from 1975 to 1982. Information for all investigations that included specific information in entry lags due to plant and equipment are included. With one exception, the investigations concerned events and conditions in the late 1970s and early 1980s. Because of the confidential nature of internal documents, the investigations are only identified with respect to their general industry and the court cases are interspersed with the information from investigations. The court cases reviewed include all cases that turned up in a 1988 computer data base search requesting cases with references to the Horizontal Merger Guidelines. Most of the litigated cases concerned events and conditions in the early to mid-1980s. All cases are included in which the court discussed entry lags due to plant and equipment requirements. Approximately half of the total sample came from litigated cases and half from FTC investigations.

Table 2
Entry Lag Estimates and Actuals¹

Line of Business Number and Description Associated with Case	Total Project (T) and Construction Related (C) Lags, in Months, Estimated from MES Data	Trial or FTC Staff Based Lag Estimates for Plant and Equipment
20.01—meat packing	T = 26 C = 20	18 months
20.03—fluid milk	T = 20 C = 13 or less	less than 2 years ²
20.08—other preserved fruits and vegetables	T = 26 C = 20	less than 2 years
20.12—flour, rice, and other grain milling	T = 26 C = 20	3 years or more
20.26—bottled and canned soft drinks	T = 20 C = 13	less than 2 years ³
20.51—malt, malt beverages, wines and brandy	T = 36+ C = 30	long and increasing
29.01—petroleum refining	T = 36+ C = 30	3 years or more
30.01—tires and inner tubes	T = 36+ C = 30	3 years or more
32.02—glass containers	T = 26 C = 20	2 years or more
32.05—cement, hydraulic	T = 24 C = 18	3 years or more
33.07—primary nonferrous metals	T = 36+ C = 30	long delays from construction and regulation
33.07—primary nonferrous metals [two cases]	T = 36+ C = 30	3 years or more

¹ Three additional cases were found with specific entry estimates in retail service industries. Since retail service industries generally entail very small minimum efficient scale operations, the construction-based estimates for these cases should be very low. In two of the instances, the cases also found short entry lags. In the third, there was insufficient evidence to conclude that the lag was short, but there was little evidence of a long lag period. One case was found involving a public utility. Construction lags for public utilities should be long because of the large capital investment associated with distribution activities of utilities. The case found a long entry lag due to construction and regulation lags. Two major consumer entertainment industry cases were found. No particularly large construction lags should be found with services of this type because relatively little plant or equipment is inherently necessary to do business although substantial, long-term contractual obligations are commonly involved. In both cases, entry lags were found to be long, but not because of construction lags. One computer software case was found. Computer software should have very low construction lags since relatively little equipment is required. The case found minimal entry lags, none of which involved construction considerations.

² Entry lags greater than three years to obtain economies of scale.

³ Economies of scale are increasing causing construction lags to increase over time as well.

Table 2 (continued)

Line of Business Number and Description Associated with Case	Total Project (T) and Construction Related (C) Lags, in Months, Estimated from MES Data	Trial or FTC Staff Based Lag Estimates for Plant and Equipment
35.37—miscellaneous machinery except electrical [two cases]	T = 26 C = 20	short
36.12—household appliances NEC, elect.	T = 36 C = 27	3 years or more
38.08—photographic equipment and supplies	T = 36+ C = 30	18 months ⁴

⁴ Entry requires three years including lags in starting up the business and reaching efficient scale.

detailed identification of industries and cases cannot be divulged. (See note 1.)

Inspection of Table 2 provides a fairly optimistic assessment of the reliability of the construction lag estimates. While our rough MES-based estimates may not be "close enough for government work," they appear to make a reasonable starting point. In particular, in the eight instances when the MES-based estimate indicates long entry lags due to construction exceeding three years, the cases/investigations reached the same conclusion in seven instances. Short lags were found by both the MES estimates and by the cases/investigations in two instances. For the middle range estimates, the picture is less clear. Of seven MES lag estimates of two years to two years and eleven months, the cases/investigations found lags of less than two years in four instances. Overall, the MES-based estimates of entry lags due to construction and planning either agreed with the case-based estimates or exceeded the case-based estimates in every instance but one. In only two instances did the lag estimates differ by more than six months.

C. IMPLICATIONS OF ENTRY LAG DATA

The entry lag data indicate that it is likely to take more than two years to enter large numbers of industries when substantial new construction is required. This finding has two important implications. For policymakers, it implies that the two-year standard is a difficult enough standard to satisfy that relatively few markets will be inappropriately labeled as "easy entry" markets when entry is in fact difficult. For practitioners, it implies that the use of "easy entry" arguments will usually require the

identification of potential entrants that have already undertaken substantial investment that will accelerate entry.

VI. SUMMARY

Entry lags are important structural characteristics of markets. They slow entry and may even deter entry altogether. Economists have long recognized that when entry is slow, incumbents may sustain monopolistic prices for long periods of time to the detriment of consumers. It is somewhat less well understood that entry lags can work in conjunction with other market characteristics to create entry barriers. However, as was shown above, the presence of significant entry lags raises the possibility that today's potential entrants face very different investment circumstances than incumbents did when they entered.

Because the presence of lengthy entry lags does suggest that a market may not be self-policing, it is appropriate that the antitrust agencies identify the presence of entry lags as a key market characteristic that will be considered. While the Merger Guidelines appear to ignore the fact that entry lags can be associated with entry barriers, the policy decision to use a relatively clear two-year criteria in defining timely entry generally captures these considerations. In the dynamic sense, the Guidelines ignore changes from no entry lags to modest entry lags, but the Guidelines include within their purview the more important instances when lags have moved into the moderate to long range. Moreover, as our empirical work suggests, the entry lag standards in the Guidelines have been set at low enough levels that it appears likely that relatively few markets will be inappropriately labeled as "easy entry" markets when entry is in fact difficult. In fact, since roughly two-thirds of the industries we examined appear to involve two-year entry lags when the entrant starts from scratch, it appears that practitioners who wish to argue that timely entry is feasible should often focus on identifying potential entrants that have already invested in assets that will accelerate entry.