Technology, Life Cycles and Industry Dynamics

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1. Introduction

Two stylized facts that have emerged consistently in the economics literature pose something of a puzzle to scholars of industrial organization. The first, which has received considerable attention at least since the seminal study by Herbert Simon and Charles Bonini (1958) some four decades ago, is the persistence of an asymmetric firm-size distribution predominated by small enterprises. Ijiri and Simon (1977, p. 2) characterize this "regularity in social phenomena that is both striking and observable in a number of quite diverse situations. It is a regularity in the size distribution of firms."[1]

In fact, virtually no other economic phenomenon has persisted as consistently as the skewed asymmetric firm-size distribution. Not only is it almost identical across every manufacturing industry, but it has remained strikingly constant over time, at least since the Second World War, and even across developed industrialized nations.

The second puzzling result is that the entry of new firms into an industry is not substantially deterred in industries where scale economies and innovative activity play an important role. The traditional theory in industrial organization would have predicted that the presence of daunting barriers to entry would have deterred the start-up and entry of new firms in such industries.

Lucas (1979) attempted to explain the pervasiveness of small enterprises in the firm-size distribution with a static theory. In this paper, an evolutionary theory is introduced. According to this evolutionary theory, the answer to the question, "How are small and suboptimal enterprises able to be viable?" is "They are not--at least not by remaining small and subotimal." Rather, such new suboptimal scale firms are engaged in the selection process, whereby the successful enterprises grow and ultimately approach or attain the optimal size, whereas the remainder stagnate and may ultimately forced to exit out of the market. Thus, the persistence of an asymmetric firm-sized distribution skewed toward small enterprises presumably reflects a continuing process of entry into industries and not necessarily the survival of such small enterprises over a long period of time. That is, although the skewed size distribution of firms persists with remarkable stability over time, it does not appear to be a constant set of small firms that is responsible for this skewness.

In particular, this evolutionary theory analyzes the process by which new firms enter into industrial markets, either grow and survive or exit from the industry, and possibly displace incumbent corporations. At the heart of this evolutionary process is innovation, because the potential for innovative activity serves as the driving force behind much of the evolution of industries. And it is innovative activity that explains why the patterns of industry evolution vary from industry to industry, depending upon the underlying knowledge conditions, or what Nelson and Winter (1982) term *technological regimes*.

The purpose of this paper is to link this new theory on innovation and industry evolution to the recent empirical evidence. In the following section the theory linking innovation to industry evolution is presented. This theory is evolutionary in that it focus on the role of new firms in the generation of diversity and the process of selection among diverse alternatives. The evidence supporting this evolutionary theory is provided in the third section. The new evolutionary theory and evidence are combined to present two views of industry evolution in the fourth section. Finally, in the fifth section a summary and conclusion are provided.

2. Innovation and Industry Evolution

Coase (1937) was awarded a Nobel Prize for explaining why a firm should exist. But why should more than one firm exist in an industry?[4] One answer is provided by the traditional economics literature focusing on industrial organization. An excess level of profitability induces entry into the industry. And this is why the entry of new firms is interesting and important -- because the new firms provide an equilibrating function in the market, in that the levels of price and profit are restored to the competitive levels.

The model proposed by Audretsch (1995) refocuses the unit of observation away from firms deciding whether to increase their output from a level of zero to some positive amount in a new industry, to individual agents in possession of new

knowledge that, due to uncertainty, may or may not have some positive economic value. It is the uncertainty inherent in new economic knowledge, combined with asymmetries between the agent possessing that knowledge and the decision making vertical hierarchy of the incumbent organization with respect to its expected value that potentially leads to a gap between the valuation of that knowledge.

How the economic agent chooses to appropriate the value of his knowledge, that is either within an incumbent firm or by starting or joining a new enterprise will be shaped by the knowledge conditions underlying the industry. Under the routinized technological regime the agent will tend to appropriate the value of his new ideas within the boundaries of incumbent firms. Thus, the propensity for new firms to be started should be relatively low in industries characterized by the routinized technological regime.

By contrast, under the entrepreneurial regime the agent will tend to appropriate the value of his new ideas outside of the boundaries of incumbent firms by starting a new enterprise. Thus, the propensity for new firms to enter should be relatively high in industries characterized by the entrepreneurial regime.

Audretsch (1995) suggests that divergences in the expected value regarding new knowledge will, under certain conditions, lead an agent to exercise what Albert O. Hirschman (1970) has termed as *exit* rather than *voice*, and depart from an incumbent

enterprise to launch a new firm. But who is right, the departing agents or those agents remaining in the organizational decision making hierarchy who, by assigning the new idea a relatively low value, have effectively driven the agent with the potential innovation away? *Ex post* the answer may not be too difficult. But given the uncertainty inherent in new knowledge, the answer is anything but trivial *a priori*.

Thus, when a new firm is launched, its prospects are shrouded in uncertainty. If the new firm is built around a new idea, i.e., potential innovation, it is uncertain whether there is sufficient demand for the new idea or if some competitor will have the same or even a superior idea. Even if the new firm is formed to be an exact replica of a successful incumbent enterprise, it is uncertain whether sufficient demand for a new clone, or even for the existing incumbent, will prevail in the future. Tastes can change, and new ideas emerging from other firms will certainty influence those tastes.

Finally, an additional layer of uncertainty pervades a new enterprise. It is not known how competent the new firm really is, in terms of management, organization, and workforce. At least incumbent enterprises know something about their underlying competencies from past experience. Which is to say that a new enterprise is burdened with uncertainty as to whether it can produce and market the intended product as well as sell it. In both cases the degree of uncertainty will typically exceed that confronting incumbent enterprises.

This initial condition of not just uncertainty, but greater degree of uncertainty vis-à-vis incumbent enterprises in the industry is captured in the theory of firm selection

and industry evolution proposed by Boyan Jovanovic (1982). Jovanovic presents a model in which the new firms, which he terms *entrepreneurs*, face costs that are not only random but also differ across firms. A central feature of the model is that a new firm does not know what its cost function is, that is its relative efficiency, but rather discovers this through the process of learning from its actual post-entry performance. In particular, Jovanovic (1982) assumes that entrepreneurs are unsure about their ability to manage a new-firm startup and therefore their prospects for success. Although entrepreneurs may launch a new firm based on a vague sense of expected post-entry performance, they only discover their true ability -- in terms of managerial competence and of having based the firm on an idea that is viable on the market -- once their business is established. Those entrepreneurs who discover that their ability exceeds their expectations expand the scale of their business, whereas those discovering that their post-entry performance is less than commensurate with their expectations will contact the scale of output and possibly exit from the industry. Thus, Jovanovic's model is a theory of *noisy selection*, where efficient firms grow and survive and inefficient firms decline and fail.

The role of learning in the selection process has been the subject of considerable debate. On the one hand is what has been referred to as the *Larackian* assumption that learning refers to adaptations made by the new enterprise. In this sense, those new firms that are the most flexible and adaptable will be the most successful in adjusting to whatever the demands of the market are. As Nelson and Winter (1982, p. 11) point

out, "Many kinds of organizations commit resources to learning; organizations seek to copy the forms of their most successful competitors."

On the other hand is the interpretation that the role of learning is restricted to discovering if the firm has the *right stuff* in terms of the goods it is producing as well as the way they are being produced. Under this interpretation the new enterprise is not necessarily able to adapt or adjust to market conditions, but receives information based on its market performance with respect to its *fitness* in terms of meeting demand most efficiently vis-à-vis rivals. The theory of organizational ecology proposed by Michael T. Hannan and John Freeman (1989) most pointedly adheres to the notion that, "We assume that individual organizations are characterized by relative inertia in structure." That is, firms learn not in the sense that they adjust their actions as reflected by their fundamental identity and purpose, but in the sense of their perception. What is then learned is whether or not the firm has the right stuff, but not how to change that stuff.

The theory of firm selection is particularly appealing in view of the rather startling size of most new firms. For example, the mean size of more than 11,000 new-firm startups in the manufacturing sector in the United States was found to be fewer than eight workers per firm (Audretsch, 1995).[5] While the minimum efficient scale (MES) varies substantially across industries, and even to some degree across various product classes within any given industry, the observed size of most new firms is sufficiently small to ensure that the bulk of new firms will be operating at a suboptimal scale of

output. Why would an entrepreneur start a new firm that would immediately be confronted by scale disadvantages?

An implication of the theory of firm selection is that new firms may begin at a small, even suboptimal, scale of output, and then if merited by subsequent performance expand. Those new firms that are successful will grow, whereas those that are not successful will remain small and may ultimately be forced to exit from the industry if they are operating at a suboptimal scale of output.

Subsequent to entering an industry, a firm must decide whether to maintain its output (Q_{it}), expand, contract, or exit. Two different strands of literature have identified several major influences shaping the decision to exit an industry. The first, and most obvious strand of literature suggests that the probability of a business exiting will tend to increase as the gap between its level of output and the minimum efficient scale (MES) level of output increases.[6] The second strand of literature points to the role that the technological environment plays in shaping the decision to exit. As Dosi (1988)) and Arrow (1962) argue, an environment characterized by more frequent innovation may also be associated with a greater amount of uncertainty regarding not only the technical nature of the product but also the demand for that product. As technological uncertainty increases, particularly under the entrepreneurial regime, the likelihood that the business will be able to produce a viable product and ultimately be able to survive decreases.

These two forces combine to shape the probability of a new firm remaining in business in period t, or **Fehler! Schalterargument nicht angegeben.**

$$P(Q_{it} > 0) = f(i_{it}, c(Q_{it}) - c(Q^{*})), \quad (1)$$

where $c(Q_{it})$ is the average cost of producing at a scale of output Q_i, and c(Q*) is the average cost of producing at the MES level of output, or the minimum level of production required to attain the minimum average cost, Q*. One of the main points to be emphasized is that, as firm size grows relative to the MES level of output, the more likely the firm is to decide to remain in the industry. This suggests that either an increase in the startup size of the firm or a decrease in the MES level of output should increase the likelihood of survival. It also implies that, given a level of MES output in an industry, the greater the size of the firm, the less it will need to grow in order to exhaust the potential scale economies. Notice that this theory is strikingly contradictory to the more typical and traditional theory that growth will be positively related to size for new firms, since larger firms are presumed to have access to greater financial resources.

The rather ambiguous role of innovative activity should also be emphasized. On the one hand, a greater perceived likelihood of innovating (i) will lead the firm to remain in an industry, even if other factors, such as the gap between the firm's size and the MES level of output resulting in a cost differential of $c(Q_{it})$-$c(Q^*_i)$ would otherwise have led the firm to exit out of the industry. Seen from this perspective, firms in a highly

innovative environment will tend to have a lower propensity to exit, *ceteris paribus*, as long as the perceived likelihood of innovative activity is relatively high. On the other hand, the likelihood that the firm will actually end up producing a viable product for which there is sufficient demand will clearly be lower in more innovative environments. A paradox could be that new firms may have a greater likelihood of innovating under the entrepreneurial regime than under the routinized regime. Yet, the likelihood that the new firm will emerge with a viable and marketable product is greater in industries where there is less technological and product uncertainty.

That is, the actual innovative activity of the firm, I_{it}, and not the likelihood of that innovative activity, iit, will ultimately determine its actual level of output in period t, Q_{it}, so that

$$Q_{it}=Q_{it}+Q(I_t) \qquad (2)$$

where Q_{it} is a factor of the firm's output in the previous period,

$$Q_{it} = Q_{i0} + aQ_{it-1} \qquad (3)$$

and Q_0 is an autonomous level of output and a is a factor representing the portion of the previous period's output that can be maintained in the market the next period (this could be zero in some cases). Factors such as market growth presumably influence the value of a. That is, if market growth is sufficiently high, a new firm may be able to grow enough so that $Q_{it}=Q^*_i$, even in the absence of innovative activity.

An important implication of the dynamic process of firm selection and industry evolution is that new firms are more likely to be operating at a suboptimal scale of output if the underlying technological conditions are such that there is a greater chance of making an innovation, that is under the entrepreneurial regime. If new firms successfully learn and adapt, or are just plain lucky, they grow into viably sized enterprises. If not, they stagnate and may ultimately exit from the industry. This suggests, that entry and the startup of new firms may not be greatly deterred in the presence of scale economies. As long as entrepreneurs perceive that there is some prospect for growth and ultimately survival, such entry will occur. Thus, in industries where the MES is high, it follows from the observed general small size of new-firm startups that the growth rate of the surviving firms would presumably be relatively high.

At the same time, those new firms not able to grow and attain the MES level of output would presumably be forced to exit from the industry, resulting in a relatively low likelihood of survival. In industries characterized by a low MES, neither the need for growth, nor the consequences of its absence are as severe, so that relatively lower growth rates but higher survival rates would be expected. Similarly, in industries where the probability of innovating is greater, more entrepreneurs may actually take a chance that they will succeed by growing into a viably sized enterprise. In such industries, one would expect that the growth of successful enterprises would be greater, but that the likelihood of survival would be correspondingly lower.

Summarizing these arguments, the theory of firm selection and industry evolution leads to the following predictions, or hypotheses, concerning the likelihood of survival and growth rates of those surviving new firms:

1. The likelihood of new-firm survival should be lower in industries exhibiting greater scale economies. The growth rates observed in surviving firms in high MES industries should be greater.

2. The likelihood of firm survival should be higher for larger firms but growth rates should be lower.

3.The likelihood of firm survival should be lower under the entrepreneurial technological regime but the growth rates of surviving firms should be greater.

4.Both firm growth and the likelihood of survival should be greater in high-growth industries.

3. Empirical Evidence

3.1. Innovation

While the concept of technological regimes does not lend itself to precise measurement, the major conclusion of Acs and Audretsch (1988 and 1990) was that the existence of these distinct regimes can be inferred by the extent to which small firms are able to innovate relative to the total amount of innovative activity in an

industry. That is, when the small-firm innovation rate is high relative to the total innovation rate, the technological and knowledge conditions are more likely to reflect the entrepreneurial regime. The routinized regime is more likely to exhibit a low small-firm innovation rate relative to the total innovation rate.

3.2. Entry

Empirical evidence in support of the traditional model of entry, which focuses on the role of excess profits as the major incentive to enter, has been ambiguous at best, leading Geroski (1991, p. 282) to conclude, "Right from the start, scholars have had some trouble in reconciling the stories told about entry in standard textbooks with the substance of what they have found in their data. Very few have emerged from their work feeling that they have answered half as many questions as they have raised, much less that they have answered most of the interesting ones."

Perhaps one reason for this trouble is the inherently static model used to capture an inherently dynamic process. Manfred Neumann (1993, pp. 593-594) has criticized this traditional model of entry, as found in the individual country studies contained in Geroski and Schwalbach (1991), because they "are predicated on the adoption of a basically static framework. It is assumed that startups enter a given market where they are facing incumbents which naturally try to fend off entry. Since the impact of entry on the performance of incumbents seems to be only slight, the

question arises whether the costs of entry are worthwhile, given the high rate of exit associated with entry. Geroski appears to be rather skeptical about that. I submit that adopting a static framework is misleading...In fact, generally, an entrant can only hope to succeed if he employs either a new technology or offers a new product, or both. Just imitating incumbents is almost certainly doomed to failure. If the process of entry is looked upon from this perspective the high correlation between gross entry and exit reflects the inherent risks of innovating activities...Obviously it is rather difficult to break loose from the inherited mode of reasoning within the static framework. It is not without merit, to be sure, but it needs to be enlarged by putting it into a dynamic setting."

Still, one of the most startling results that has emerged in empirical studies is that entry by firms into an industry is apparently not substantially deterred or even deterred at all in capital-intensive industries in which scale economies play an important role (Audretsch, 1995).[7] While studies have generally produced considerable ambiguity concerning the impact of scale economies and other measures traditionally thought to represent a *barrier to entry*, Audretsch (1995) found conclusive evidence linking the technological regime to startup activity. New-firm startup activity tends to be substantially more prevalent under the entrepreneurial regime, or where small enterprises account for the bulk of the innovative activity, than under the routinized regime, or where the large incumbent enterprises account for most of the innovative activity. These findings are consistent with the view that differences in beliefs about the

expected value of new ideas are not constant across industries but rather depend on the knowledge conditions inherent in the underlying technological regime.

3.3. Survival

Geroski (1995) and Audretsch (1995) point out that one of the major conclusions from studies about entry is that the process of entry does not end with entry itself. Rather, it what happens to new firms subsequent to entering that sheds considerable light on industry dynamics. The early studies (Mansfield, 1962; Hall, 1987; Dunne, Roberts and Samuelson, 1989; and Audretsch, 1991) established not only that the likelihood of a new entrant surviving is quite low, but that the likelihood of survival is positively related to firm size and age. More recently, a wave of studies have confirmed these findings for diverse countries, including Portugal (Mata, Portugal and Guimaraes, 1994; and Mata, 1994), Germany (Wagner, 1994), and Canada (Baldwin and Gorecki, 1991; Baldwin, 1995, and Baldwin and Rafiquzzaman, 1995).

Audretsch (1991), Audretsch and Mahmood (1995) shifted the relevant question away from *Why does the likelihood of survival vary systematically across firms?* to *Why does the propensity for firms to survive vary systematically across industries?* The answer to this question suggests that what had previously been considered to pose a barrier to entry may, in fact, constitute not an entry barrier but rather a barrier to survival. The answer to this questions suggests that what had

previously been considered to pose a barrier to entry may, in fact, constitute not an entry barrier but rather a barrier to survival.

3.4. Growth

What has become known as *Gibrat's Law*, or the assumption that growth rates are invariant to firm size, has been subject to numerous empirical tests. Studies linking firm size and age to growth have also produced a number of stylized facts (Wagner, 1992). For small and new firms there is substantial evidence suggesting that growth is negatively related to firm size and age (Hall, 1987; Wagner, 1992 and 1994; Mata, 1993, and Audretsch, 1995). However, for larger firms, particularly those having attained the minimum efficient scale (MES) level of output, the evidence suggests that firm growth is unrelated to size and age.

An important finding of Audretsch (1991 and 1995) and Audretsch and Mahmood (1995) is that although entry may still occur in industries characterized by a high degree of scale economies, the likelihood of survival is considerably less. People will start new firms in an attempt to appropriate the expected value of their new ideas, or potential innovations, particularly under the entrepreneurial regime. As entrepreneurs gain experience in the market they learn in at least two ways. First, they discover whether they possess *the right stuff*, in terms of producing goods and offering services for which sufficient demand exists, as well as whether they can product that

good more efficiently than their rivals. Second, they learn whether they can adapt to market conditions as well as to strategies engaged in by rival firms. In terms of the first type of learning, entrepreneurs who discover that they have a viable firm will tend to expand and ultimately survive. But what about those entrepreneurs who discover that they are either not efficient or not offering a product for which their is a viable demand? The answer is, *It depends -- on the extent of scale economies as well as on conditions of demand*. The consequences of not being able to grow will depend, to a large degree, on the extent of scale economies. Thus, in markets with only negligible scale economies, firms have a considerably greater likelihood of survival. However, where scale economies play an important role the consequences of not growing are substantially more severe, as evidenced by a lower likelihood of survival.

3.5. Wages and Compensating Factor Differentials

How are the new firms, many of which operate at a suboptimal scale of output, able to exist? The answer according to the studies on post-entry survival and growth is that they cannot -- at least not indefinitely. Rather, they must growth to at least approach the MES level of output. An alternative answer is provided by recent studies focusing on the relationship between firm size, age and employee compensation (Audretsch, 1995). By deploying a strategy of *compensating factor differentials*, where factor inputs are both deployed and remunerated differently than they are by the

larger incumbent enterprises, suboptimal scale enterprises are to some extent able to offset their size-related cost disadvantages.

Just as it has been found that the gap between the MES and firm size lowers the likelihood of survival, there is evidence suggesting that factors of production, and in particular labor, tend to be used more intensively (that is, in terms of hours worked) and remunerated at lower levels (in terms of employee compensation). Taken together, the empirical evidence on survival and growth combined with that on wages and firm size suggests how it is that small, suboptimal scale enterprises are able to exist in the short run. In the initial period of learning, during which time the entrepreneur discovers whether he has the *right stuff* and whether he is able to adapt to market conditions, new firms are apparently able to reduce the cost of production in order to compensate for their small scale of production.

In the current debate on the relationship between employment and wages it is typically argued that the existence of small firms which are sub-optimal within the organization of an industry represents a loss in economic efficiency. This argument is based on a static analysis, however. When viewed through a dynamic lens a different conclusion emerges. One of the most striking results is the finding of a positive impact of firm age on productivity and employee compensation, even after controlling for the size of the firm. Given the strongly confirmed stylized fact linking both firm size and age to a negative rate of growth (that is the smaller and younger a firm, that faster it will grow but the lower is its likelihood of survival), this new finding linking firm age

to employee compensation and productivity suggests that not only will some of the small and sub-optimal firms of today become the large and optimal firms of tomorrow, but there is at least a tendency for the low productivity and wage of today to become the high productivity and wage of tomorrow.

4. Two Models of Industry Evolution

What emerges from the new theories and empirical evidence on innovation and industry evolution is that markets are in motion, with a lot of firms entering the industry and a lot of firms exiting out of the industry. But is this motion horizontal, in that the bulk of firms exiting are comprised of firms that had entered relatively recently, or vertical, in that a significant share of the exiting firms had been established incumbents that were displaced by younger firms? In trying to shed some light on this question, Audretsch (1995) proposes two different models of the evolutionary process of industries over time. Some industries can be best characterized by the model of the conical revolving door, where new businesses enter, but where there is a high propensity to subsequently exit from the market. Other industries may be better characterized by the metaphor of the forest, where incumbent establishments are displaced by new entrants. Which view is more applicable apparently depends on three major factors -- the underlying technological conditions, scale economies, and demand. Where scale economies play an important role, the model of the revolving door seems to be more applicable. While the rather starting result discussed above that the startup

and entry of new businesses is apparently not deterred by the presence of high scale economies, a process of firm selection analogous to a revolving door ensures that only those establishments successful enough to grow will be able to survive beyond more than a few years. Thus the bulk of new entrants that are not so successful ultimately exit within a few years subsequent to entry.

There is at least some evidence also suggesting that the underlying technological regime influences the process of firm selection and therefore the type of firm with a higher propensity to exit. Under the entrepreneurial regime new entrants have a greater likelihood of making an innovation. Thus, they are less likely to decide to exit from the industry, even in the face of negative profits. By contrast, under the routinized regime the incumbent businesses tend to have the innovative advantage, so that a higher portion of exiting businesses tend to be new entrants. Thus, the model of the revolving door is more applicable under technological conditions consistent with the routinized regime, and the metaphor of the forest, where the new entrants displace the incumbents -- is more applicable to the entrepreneurial regime.

Why is the general shape of the firm-size distribution not only strikingly similar across virtually every industry -- that is, skewed with only a few large enterprises and numerous small ones -- but has persisted with tenacity not only across developed countries but even over a long period of time? The evolutionary view of the process of industry evolution is that new firms typically start at a very small scale of output. They are motivated by the desire to appropriate the expected value of new economic

knowledge. But, depending upon the extent of scale economies in the industry, the firm may not be able to remain viable indefinitely at its startup size. Rather, if scale economies are anything other than negligible, the new firm is likely to have to grow to survival. The temporary survival of new firms is presumably supported through the deployment of a strategy of compensating factor differentials that enables the firm to discover whether or not it has a viable product.

The empirical evidence supports such an evolutionary view of the role of new firms in manufacturing, because the post-entry growth of firms that survive tends to be spurred by the extent to which there is a gap between the MES level of output and the size of the firm. However, the likelihood of any particular new firm surviving tends to decrease as this gap increases. Such new suboptimal scale firms are apparently engaged in the selection process. Only those firms offering a viable product that can be produced efficiently will grow and ultimately approach or attain the MES level of output. The remainder will stagnate, and depending upon the severity of the other selection mechanism -- the extent of scale economies -- may ultimately be forced to exit out of the industry. Thus, the persistence of an asymmetric firm-size distribution biased towards small-scale enterprise reflects the continuing process of the entry of new firms into industries and not necessarily the permanence of such small and sub-optimal enterprises over the long run. Although the skewed size distribution of firms persists with remarkable stability over long periods of time, a constant set of small and suboptimal scale firms does not appear to be responsible for this skewed distribution.

5. Implications for Public Policy

The vision of the link between the firm and the market typically shapes public policy. The new learning strongly argues for a vision of the firm in the market as one that is dynamic, fluid, and turbulent. Change is more the rule and stability the exception.

The public policies emerging in the post-war period dealing with the firm in the market were essentially constraining in nature. There were three general types of public policies towards business -- antitrust (competition policy), regulation, and public ownership. All three of these policy approaches towards the firm in the market restricted the firm's freedom to contract. While specific policy approaches tended to be more associated with one country than with others, such as antitrust in the United States, or public ownership in France and Sweden, all developed countriesshared a common policy approach of intervening to restrain what otherwise was perceived as too much market power held by firms. Public policies constraining the freedom of the firm to contract were certainly consistent with the *Weltanschauung* emerging from the theories and empirical evidence regarding the firm in the market during the post-war period. Left unchecked, the large corporation in possession of market power would allocate resources in such a way as to reduce economic welfare. Through state intervention the Williamsonian trade-off between efficiency on the hand and fairness on

the other would be solved in a manner that presumably would be more socially satisfying.

But more recently the relevant policy question has shifted away from *How can the government constrain firms from abusing their market power?* to *How can governments create an environment fostering the success and viability of firms?* The major issues of the day have shifted away from concerns about excess profits and abuses of market dominance to the creation of jobs, growth and international competitiveness. The concern about corporations is now more typically not that they are too successful and powerful but that they are not successful and powerful enough. Thus, the government policies of the 1990s have increasingly shifted away from *constraining* to *enabling*. Governments are increasingly promoting joint R&D programs, fostering efforts to innovate and the creation of new firms.

In fact, the shift in public policies towards creating an environment where the production and application of new knowledge is encouraged is consistent with public policies towards business throughout Europe and North America. After all, the observataion that the structure of firms and markets tends to be remarkably fluid and turbulent is not new. Before the country was even half a century old, Alexis de Tocqueville, in 1935, reported, "What astonishes me in the United States is not so much the marvellous grandeur of some undertakings as the innumerable multitude of small ones."[11]

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[1] Ijiri and Simon (1977, pp. 1-2) observe that, "Nature, as it presents itself to the physical scientist, is full of clearly defined patterns...The patterns that have been discovered in social phenomena are much less neat. To be sure economics has evolved a highly sophisticated body of mathematical laws, but for the most part, these laws bear a rather distinct relation to empmirical phenomena...Hence, on those occasions when a social phenomenon appears to exhibit some of the same simplicity and regularity of pattern as is seen so commonly in physics, it is bound to excite interest and attention."

[4] Coase (1937, p. 23) himself asked, "A pertinent question to ask would appear to be (quite apart from the monopoly considerations raised by Professor Knight), why, if by organizing one can eliminate certain costs and in fact reduce the cost of production, are there any market transactions at all? Why is not all production carried on by one big firm?"

[5] A similar start-up size for new manufacturing firms has been found by Dunne, Roberts and Samuelson (1989) for the United States, Mata (1994) and Mata and Portugal (1994) for Portugal, and Wagner (1994) for Germany.

[6] For example, Weiss (1976, p. 126) argues that, "In purely competitive long-run equilibrium, no suboptimal capacity should exist at all."

[7] The country studies included in Geroski and Schwalbach (1991) also indicate considerable ambiguities between measures reflecting the extent of scale economies and capital intensity on the one hand, and entry rates on the other.

[11] Quoted from *Business Week*, Bonus Issue, 1993, p. 12.