Will most of us be working for giant enterprises by 2028?

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Abstract

Various economic theories yield quite opposite predictions about the changing size of enterprises and establishments and the purpose of this essay is to present some stylized facts to begin to resolve some of these theoretical confusions. The estimates for this purpose cover a period of almost four decades. They show that average establishment size has decreased since the late 1960s, that the number of establishments per enterprise has leveled off since the early 1980s, and that the average size of enterprises reveals an undulating pattern with a sharp upturn at the end of the century due to the impact of the merger wave. Considerable attention is paid to the causal factors underlying these changes, particular in reference to the conflicting theoretical evidence. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

From 1985 through 1999, the dollar value of world mergers increased at an average annual rate of 21 percent; for mergers involving just US firms, the annual rate was 18 percent (Pryor, 2000a). Total mergers and acquisitions in the world reached 2.3 trillion dollars in 1999. The capstone of this merger tsunami occurred in the first 5 weeks of 2000 with the announcement of five mega-mergers with a total value of more than 0.5 trillion dollars.

Merger data in isolation tell us little about changes in the structure of production. Obviously, if firms are simultaneously buying and selling parts of enterprises, the size distribution
and average size of firms could remain roughly the same. Ijiri and Simon (1971) present a less intuitive model where, under common dynamic conditions, the merger process does not necessarily lead to any significant changes in either the distribution or average size of enterprises. They argue this might explain the roughly stable structure in the size distribution of manufacturing from 1930 to 1960. On the other hand, under other dynamic conditions it is also possible to theorize that a rising volume of mergers will lead to a radical shift in the size distribution of firms so that most of us might be working for giant enterprises in the future — the trillion-dollar enterprise, as one recent book title has announced (Friedheim, 1998).

Leaving aside the question of whether such mergers lead to a rising level of market concentration, a matter discussed elsewhere (Pryor, 2000b), the impact of these mergers on firm size raise a number of other concerns. The distribution of enterprise size may influence technical change. For instance, research over the last few decades (e.g., Scherer, 1965 or Acs and Audretsch, 1991a,b) suggests that both patented inventions and innovations generally increase less than proportionately to firm size. Or work satisfaction, measured both by surveys and also by behavioral measures (such as lower absenteeism), appears greater in both small establishments and firms than in larger units (Lang and Johnson, 1994; Dunn, 1982; Shepard and Hougland, 1982; and Scherer, 1976). Furthermore, since wage inequalities are less in small than in large establishments and enterprises (Davis and Haltiwanger, 1995; Schmidt and Zimmermann, 1991; and Dunn, 1982), the size distribution of enterprises has an impact on the distribution of income. Moreover, giant corporations may be “too large to fail,” which has implications for governmental policy as well. Finally, the growth of a small number of firms employing an increasingly larger share of the labor force may have some seriously adverse political implications as well, a conjecture difficult to test and disputed by some.¹

A major problem in discussion of the changing size distribution of enterprises is that the basic data are not very satisfactory and, as a result, we lack the stylized facts necessary for an informed discussion. The purpose of this essay is to disentangle the data and to explore empirically the trends in the average size and size distribution of enterprises, as measured by employed labor force, for a period of almost four decades. From this exercise we can also gain some insights into the causal forces that underlie the observed changes, as well as begin to answer the question posed in the title.

The analysis is straightforward. Section 2 looks briefly at the conflicting answers about the distribution and average size of enterprises by some leading theorists. Section 3 examines several of the critical data problems about the measurement of enterprise size over time that have hindered empirical analysis and shows how I have tried to circumvent them. The following section presents various measures of enterprise and establishment size, particularly in light of the leading theories. Section 5 explores how taking into account the foreign operations of the largest domestic firms provides greater depth to the analysis and this analysis is supplemented by examining the size of large firms in countries outside the US. Section 6 pulls the disparate strands of the argument together.

¹ Much of the evidence is in the form of case studies of particular types of legislation (e.g., Vogel’s, 1982 study of air pollution legislation) and considerable disagreements arise about the meaning of the results of such studies. Clearly, the impact of enterprise size on legislation depends to a considerable degree upon the type of laws being considered.
2. Some current theories

Although a number of models help us to understand why the size distribution of enterprises has different parameters in one industry than another, we have less help in understanding what is happening in the entire economy. The major theories discussed below yield very conflicting conclusions about future trends in the distribution or average size of enterprises. None of the theories is complete and, moreover, certain empirical evidence casts doubt on the assumptions underlying each of them.

2.1. Technical progress and increasing returns to scale

The Marxist tradition holds that enterprises are becoming increasingly larger and, moreover, the largest enterprises are accounting for an increasingly larger share of production. The argument is based on the assumption that technological change leads to infinite economies of scale, such that large firms always have lower costs and higher profits than smaller firms. As a result, “One capitalist always kills many . . . [and] along with the constantly diminishing number of the magnates of capital . . . grows the mass of misery, oppression, slavery, degradation, exploitation.” (Marx, 1906, p. 836).

Joseph Schumpeter gave some intellectual respectability to this assertion by arguing that the crucial economy of scale is in enterprise administration, particularly for research and development. More specifically, only the large, oligopolistic firms can finance a satisfactory R&D program leading to new technological discoveries to maintain or increase market share. This means that a good number of the large enterprises become ever larger over time, both in absolute and relative terms. Nevertheless, this argument about the relation between research and development and enterprise size has been challenged. Various authors (e.g., Scherer, 1965, 1991; or Acs and Audretsch, 1990, 1991a,b) show that in most industries, the ratio of R&D expenditures to sales is roughly constant over most of the size range of firms. Acs and Audretsch also present evidence that in recent decades innovative activity per employee has actually been greater in small than in large firms.

Empirical evidence on the relative and absolute size of productive units over time is mixed. From 1909 to the early 1960s, the percentage of assets owned by the 100 largest industrial firms in US did not greatly change (Pryor, 1973, p. 183). On the other hand, the percentage of the labor force in manufacturing establishments (plants) over 1000 doubled in the same period and, presumably, the absolute size of manufacturing enterprises (firms) increased even faster. Clearly, hypotheses about the changing size distribution of industrial enterprises based on infinite economies of scale need many qualifications.

2 Generalizing about the average size of manufacturing establishments is tricky because of the skewness of the size distribution. The average size of establishments with more than 19 workers barely changed. Averages which placed greater weight on larger establishments (for instance, the Niehans and entropy indices) increased. Further, changes in the sectoral composition of production within manufacturing also markedly affect the results. These matters are discussed in detail by Pryor (1977, Chapter 5).

Comparable statistics of enterprise size over the first half of the century are not available. However, it seems likely that their average size increased faster than of establishments since falling costs of communication, especially as a result of the spread of the new information technology of the period, especially the telephone, lowered the costs of managing a multi-establishment firm.
It should be added that Marx’s or Schumpeter’s conclusions about the growth of large firms may be correct, but for quite different reasons than economies of scale, either of production or of administration. For instance, the increasing importance of exports in US economy might lead to larger firms, since they can cover a larger market, as Brynjolfsson et al. (1994) have econometrically shown. Further, the internal organization of firms might also have an important effect since the total compensation of top executives, not to mention their personal power, are strongly correlated with the size and growth of their companies. Thus, business executives have special incentives to fulfill Marx’s predictions.

2.2. Dynamic random processes

In the 1930s Robert Gibrat, a French engineer, argued that the percentage growth of a firm in a given period is independent of its size, a study that has given rise to an enormous literature (reviewed by Sutton, 1997). Such a random process, which assumes constant returns to scale, yields a distribution of firms with an increasing skew over time and with an increasing log variance. Although the average size enterprise (according to some measures) remains the same, a rising share of the labor force is employed by the largest firms.

Unfortunately, such a simple theoretical result is complicated by several empirical facts. First, Gilbrat’s basic assumption about the independence of growth and firm size has been attacked (e.g., Davis et al., 1996, Table 4.1). Furthermore, new firms are born and old firms die, which complicates any time-series analysis. Although it is possible to build various dynamic effects into the model (e.g., Ijiri and Simon, 1977; or Sutton, 1998), this makes the final conclusions more problematic because almost any result can be obtained with the proper assumptions. Furthermore, as Quandt (1966) has forcefully pointed out, even with data for individual firms it is very difficult to determine empirically which type of distribution best fit the data when very fine distinctions must be made. Such a task becomes impossible when the enterprises are grouped into a small number of size categories, as are the data serving as the basis of most analyses. Finally, some of the implications of Gibrat’s theory are not found for long time intervals, for instance, the rising share of the labor force on a given number of large enterprises.

2.3. The impact of information technology

Many specialists have forcefully pointed to the critical impact of falling costs of collecting, processing, and analyzing information. From such an approach, some organization theorists look upon enterprises as information-processing-entities and describe the “coming of the new organization” or the “second industrial divide.” Among other effects, such writers hypothesize (or declare) that the lower information costs reduce firm size. They offer no predictions about the change in the size distribution, although if large firms are more likely to introduce this new technology, then the centralization of the labor force in the largest firms should decrease. We need to proceed carefully because arguments based on lower information costs cut both ways.

Three arguments of this approach focus primarily on factors leading to declining establishment (plant) size:
1. The new information technology has reduced the specificity of capital, which means that the same machine can be used for multiple purposes in the production process. From a different perspective this means that the flexibility of capital has increased. As Dosi (1988, p. 1153) notes: “As compared to ‘classical’ (electromechanical) automation of mass production, numerically controlled machine tools, flexible manufacturing systems, and robots allow a much greater flexibility of production in terms of . . . minimum scale of production.” Empirical studies (summarized by Audretsch, 2000; or Carlsson et al., 1994) also show concretely how industries adopting such flexible production have experienced a greater decrease in the mean plant size than other industries. Although it should be clear that large-scale production featuring many single-purpose machines is no longer as necessary to achieve low costs, the falling information costs lead to other types of scale economies as well. For instance, firms producing their own intermediate products can now more easily subcontract such production without fear of being at the mercy of opportunistic behavior by their supplies. This occurs, of course, because the size of potential subcontracts falls as well, so that competition among potential subcontractors becomes more intense and the subcontracting industry is no longer dominated by a few large producers with the necessary complement of large machines.

2. The new information technology lowers the cost of transacting with the outside world, for instance, gathering information, searching for partners, and negotiating and supervising contracts. The extreme case of such a trend is the “virtual corporation,” which has almost no labor force because it subcontracts all aspects of design, production, and sales. Allegedly it consists only of a few smart managers sitting in front of a computer screen and moving billions of dollars of inputs and products by clicking their computer mouse at the strategic place at a particular instant of time.

3. Investment in this new technology raises labor productivity and thus allows fewer workers to produce a given level of output. Other things being equal (including the size of markets), firm size as measured by labor force should decrease because of the substitution of capital for labor. Since capital/labor substitution occurred during past decades while enterprise size was increasing, investment in information technology may have special properties. Studies by Morrison and Berndt (1991, 1992), however, suggest that such investment is not a substitute for labor, but rather a complement, especially for white collar workers.

In certain respects, however, this technology might lead to larger production units, at least on the enterprise level, and two arguments need to be taken into account:

1. The new technology can decrease the costs of organizing and utilizing hierarchies, for example, long-run planning, coordination costs, supervising and evaluating in-house employees or carrying out quality controls.

2. This new technology also allows individual managers more easily to specialize, for instance, in particular functional areas such as foreign trade, and thus gain consider-

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3 The literature on information technology also features references to other types of economies of scale, but I have been unable to find any serious empirical analysis of these matters. For instance, falling information costs might yield economies of scope, or reduce costs of producing single or multiple products or of distribution or branding, but little data on these matters are available.
able economies of scale of management. As a result, outside contracting becomes less necessary and the enterprise becomes larger.

Several recent empirical studies of the manufacturing sector, particularly by Brynjolfsson et al. (1994) and by Komninos (1994), show that both enterprises and establishments with greater investment in information technology have tended to be smaller in size, other things being equal. This does not, of course, mean that the size of an average manufacturing firm has declined, but merely that it has increased less rapidly than without investment in information technology. It is also possible that firms are becoming smaller, at least in terms of employment, for reasons other than investment in the new technology. For instance, substitution of capital for labor may be increasing faster than the size of the relevant markets.

At this point it is important to look more carefully at organization and production costs, reflected crudely by differences in the size of the enterprises (or firm) as a whole and in their constituent establishments as well. An establishment (or plant) is a geographically separate unit of the firm such as a factory, sales office, retail outlet, or other specialized branch, which can interact either with the parent enterprise or with outside firms. It is possible, for instance, for new investment in information technology to lower the costs of production so that the average size of the production establishment decreases. At the same time, however, coordination costs can also fall so that the average size of the enterprise increases because the central office is more able to manage more establishments. But even the ratio of establishments to enterprises is problematic, particularly if the various establishments are producing different products or services to minimize anti-trust difficulties; thus many enterprises go through “back to basics” phases in which many of these establishments are divested before beginning once again a few years later to diversify. Although the costs of production are more often associated with establishments, while the costs of organization are tied to the firm as a whole, this parallelism can only be roughly teased out of the data because many firms consist only of a single establishment.

Examination of the changing ratio of establishments to enterprises provides some useful insights into the degree to which the evolving information technology has led to economies of administration. The evidence presented in Table 1 covers not just the manufacturing sector, which is usually the primary focus, but the entire private sector except for agriculture, forestry, and fishing. Several conclusions can be quickly drawn from these estimates.

1. The estimated establishment/enterprise ratio rose dramatically from 1954 to about 1982 and, thereafter, has leveled off or slightly declined.
2. The ratio rises with the size of the firm so that in 1992 firms with 10,000 or more workers averaged more than 500 subordinate establishments (for a firm with 50,000 workers, this means that the average establishment had about 100 employees).
3. These two trends discussed above are not affected if we hold constant the sectoral distribution of the labor force (eight major sectors 4) and recalculate the results.
4. Because the data cover only establishments in US, the data are downwardly biased for the large firms in later years because their plants located in foreign countries are omitted.

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4 These include mining; construction; manufacturing; transportation, communication, and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services. I omit agriculture (which in 1960 accounted for slightly over 3 percent of the labor force), the government sector, and the rest-of-the-world sector.
Table 1
Ratios of establishments to enterprises of different sized enterprises, 1954–1997a

<table>
<thead>
<tr>
<th>Year</th>
<th>All firms with at least 1 employee</th>
<th>Firms with &gt;19 employees</th>
<th>Firms with &gt;99 employees</th>
<th>Firms with &gt;999 employees</th>
<th>Firms with &gt;9999 employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>1.1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1958</td>
<td>1.3</td>
<td>3.0</td>
<td>9.8</td>
<td>71.1</td>
<td>306.8</td>
</tr>
<tr>
<td>1963</td>
<td>1.2</td>
<td>3.0</td>
<td>10.8</td>
<td>84.8</td>
<td>355.1</td>
</tr>
<tr>
<td>1967</td>
<td>1.2</td>
<td>3.1</td>
<td>11.6</td>
<td>97.7</td>
<td>406.4</td>
</tr>
<tr>
<td>1972</td>
<td>1.3</td>
<td>3.4</td>
<td>14.1</td>
<td>124.2</td>
<td>498.4</td>
</tr>
<tr>
<td>1977</td>
<td>1.3</td>
<td>3.5</td>
<td>14.3</td>
<td>122.5</td>
<td>488.3</td>
</tr>
<tr>
<td>1982</td>
<td>1.3</td>
<td>3.6</td>
<td>15.3</td>
<td>134.9</td>
<td>577.1</td>
</tr>
<tr>
<td>1987</td>
<td>1.3</td>
<td>3.5</td>
<td>14.1</td>
<td>128.4</td>
<td>574.6</td>
</tr>
<tr>
<td>1992</td>
<td>1.3</td>
<td>3.4</td>
<td>13.7</td>
<td>121.5</td>
<td>543.1</td>
</tr>
<tr>
<td>1997</td>
<td>1.3</td>
<td>3.3</td>
<td>12.5</td>
<td>99.5</td>
<td>547.3</td>
</tr>
</tbody>
</table>

a The data on the number of enterprises are estimated by adjusting published data on enterprise size from US Department of Commerce, Census Bureau, Enterprise Statistics, various years, for comparability to cover the entire private sector excluding agriculture. The estimation methods are described in the text. Many estimates for the number of establishments in the early years also had to be made. The data for 1997 were obtained from a special tabulation of the Census Bureau and I would like to thank Trey Cole. In the attempt to achieve consistency and total coverage of the economy, it is possible that the estimates of the establishment/enterprise ratio may be downwardly biased in the early years so that the trends are actually less marked than shown in the table. As noted in the text, a downward bias in the later years occurs for the large firms because these data cover only establishments in US and not foreign subsidiaries.

from consideration. Mergers of US and foreign firms amounted to more than a third of a trillion dollars in 1999 and are proceeding considerably faster than mergers between firms located just in the United States (Pryor, 2000a). Since a large share of these involved at least one relatively large enterprise, the trends in establishment/enterprise ratios in Table 1 must be interpreted with this in mind.

It appears that up to 1982 the new information technology, embodied primarily in mainframe computers, may have been resulted in falling internal costs of managing a large corporation. Although the number of establishments per enterprise appear to have turned downward since that time, if we would be able to take US owned establishments in foreign nations into account, it is possible that the apparent downturn either did not occur or was milder.

A final judgement on the information technology approach cannot be made, however, until we isolate the differential impact of falling information costs on more direct measures of the sizes of establishments and enterprises. We must also distinguish between changing costs of dealing with the external world and changing internal costs of production.

It is also important to stress two methodological shortcomings of the previous empirical work of those arguing the causal link between the new information technology and the falling size of enterprises. These are the ambiguities in measuring enterprise size and the incomplete nature of the available data. Both these issues, which are not addressed in either empirical study cited above, are discussed below before my own empirical results are reported.

2.4. A brief conclusion

Unfortunately, all of the theories about enterprise size and distribution discussed above currently receive some empirical support. This suggests the importance of nailing down
some stylized facts about the matter, assuming, of course, that empirical evidence is important to the proponents of these conflicting views.\textsuperscript{5}

3. A short discussion of three methodological issues

Several topics — the definition and measurement of enterprise size and the treatment of incomplete data — deserve brief discussion before presenting the empirical results. A more complete discussion of the estimation procedures is presented in a Statistical Appendix, which is available on my website [http://www.swarthmore.edu/socsci/economics/fpryor1/].

3.1. Definition of size

The size of an enterprise can be measured in various ways, for instance, by labor force, value-added, total sales, total assets, and net worth. I have chosen to measure size in terms of labor force because, for the purposes of this essay, sufficiently long time-series to make the proper comparisons cannot be estimated for any other indicator. Further, this measure directly focuses on the question posed in the title of this essay. Moreover, using a labor force measure also permits easy and valid comparisons with establishment size, in contrast to such measures as value-added which, on an establishment level, does not allow distinctions to be made between inputs coming from the outside or from other establishments of the same enterprise. To the extent that sales or assets is a more appropriate measure of size than labor force and that labor productivity is higher in larger firms, the bad news is that this biases my results. The good news is that I do not need to worry about the accuracy of industry specific price indices to make comparable the data from different years.

3.2. Indicators of size

Although both the studies by Brynjolfsson et al. and Komninos show considerable econometric sophistication, both measure enterprise size by simply dividing the total number of workers by the total number of enterprises. Unfortunately, using such an arithmetic average does not take into account the fact that the distribution is highly skewed, with 90 percent of all enterprises having less than 20 workers; indeed, 9 percent of all enterprises have no employees at all.\textsuperscript{6} As a result, the arithmetic average changes considerably when the universe is defined slightly different. In 1992, for instance, the average enterprise had 19 employees. If the enterprises with no employees are excluded (these must be primarily shell companies or else companies with only a part-time, sole proprietor), the average rises to 21, if enterprises with less than five workers are excluded, 44; if enterprises with less than

\textsuperscript{5} To avoid confusion, it is also useful to point out that the exploration of the size of firms in this essay is tangentially related to the analysis by others of the causes of the vertical integration of enterprises, a topic with an extensive empirical and theoretical literature. Nevertheless, the questions of size and vertical integration are somewhat different. For instance, although the degree of subcontracting (vertical disintegration) acts to reduce the employment size of a firm, production can increase in sufficient volume that total employment in the firm increases.

\textsuperscript{6} All data in this paragraph come from Enterprise Statistics. Other publication of the Census Bureau such as Characteristics of Business Owners yield even more skewed statistics on this matter.
are excluded, 144. It should be clear that the skewness means that a simple arithmetic average has little economic meaning. In addition, the calculation of these averages may be greatly influenced by very small changes of the size groupings or of the definition of size or of the counting of firms with very few or no employees.

Given the type of grouped size data which are available, I have chosen to use six different definitions of size. The first four focus on the size of the firm measured on an absolute scale (Marx’s “centralization of capital”): the arithmetic average of employees in firms with more than 19 workers; the “Florence median,” which is calculated by lining up workers by the size of the enterprise in which they work and then determining the size of the enterprise of the worker halfway down the line, and the average sizes of the largest 100 enterprises and also of the largest 1000 enterprises. The final two size statistics deal with size on a relative basis (Marx’s “concentration of capital”), namely the percentage of the labor force employed in enterprises with more than 999 and 9999 employees.

Ijiri and Simon (1977, p. 13) argue that these kinds of measures of size are atheoretic and that a more theoretically informed set of measures should be used. Given the stochastic model they explore, they suggest that the Pareto coefficient ($\alpha$) would be more appropriate. On my website I present the results of calculating such a measure and show that it reveals the same picture as more conventional measures of size. The underlying data used in some of these calculations also permit the calculation of the Ijiri–Simon statistic of the dynamism of the market, as revealed by the changing size ranks of the largest firms.\footnote{Ijiri and Simon argue that the standard deviation of the ratios of the size rankings for each firm at the end of the period to the size rank at the beginning measures the “dynamism of competition.” To explore the use of this statistic I use the Fortune data for largest industrial enterprises, realizing that they are not ideal for this calculation for several reasons. First, they do not include foreign firms operating in US. Second, until the last decade the Fortune list focuses only on industrial firms, so that classification of firms carrying out both industrial and service activities is difficult. Third, the list is dependent upon information voluntarily supplied by the firm and, if such information is not received, the firm is not included in the list. Fourth, the handling of subsidiaries which are predominantly owned by one company but which have separate stock issues raises other problems. For these reasons certain firms such as IT&T mysteriously appear and disappear from the Fortune list in different years. Finally, the Fortune list only covers publicly traded firms and certain large privately held enterprises are not included. Since the Fortune editors rank companies according to sales, not by employment which I have done, I have had to dip into their lists of the top 500 and 1000 firms in order to obtain my list of the largest 100 employers. Other problems arise because certain firms have changed their names, or have merged with other firms in the Fortune list. To take this matter into account, I consulted the International Directory of Company Histories (London: St. James Press) for all doubtful cases and calculate the results both including and excluding adjustments. As it turned out, such adjustments did not greatly affect the end results. Finally, since my data are only for the top 100 firms, I have assigned a rank of 150 for firms that were not in the top 100 at the beginning of the period; experiments showed that the trends are not affected by this choice. The final calculations show much greater changes in the rank orderings in the 1972–1982 decade than in either the 1963–1972 or the 1982–1992 decades. The 1982–1992 changes are also greater than the 1963–1972 changes. Since such results seem primarily to reflect merger and divestment activities of conglomerates, rather than the “dynamism of competition,” the Ijiri–Simon statistic does not seem appropriate for its intended use.}

3.3. Incomplete data

The incompleteness of data on the size distribution of enterprises is the key empirical problem and, according to one long-time specialist in the field, the topic is a “statistical
Vietnam, from which it is impossible to emerge without wounds and to declare an honorable victory.” From 1958 to the present, the Bureau of the Census has carried out a census of enterprises covering almost completely four “core” sectors, namely mining, manufacturing, wholesale trade, and retail trade and, from 1967 on, the census also covered the construction industry. Unfortunately, until 1992 statistics on enterprise size were quite incomplete for enterprises in three sectors: transportation, communications, and public utility; finance, insurance, and real estate; and services. The estimates from 1977 to 1992 presented below should be quite reliable for the missing sectors; from 1958 to 1977, however, the estimates must be taken more cautiously.

4. Some empirical results and possible interpretations

This section presents my estimates of changing enterprise and establishment size. I also examine certain obvious underlying causes such as the impact of a changing sectoral composition of production and a changing establishment.enterprise ratio.

Table 2 presents a set of estimated statistics for all sectors of the economy showing various measures of enterprise size. Calculations for just the core sectors, for which comparable data are available for the entire period, reveal the same results and are not presented.

The data reveal an undulating pattern. Sometime after the mid-1970s up through 1992, five of the six series reveal a declining enterprise size (the exception being the estimates of the average size of the top 1000 enterprises). Indeed, for four of the five series showing a decline, the high point was reached in 1977. The data on the percentage of workers in firms with at least 1000 and 10,000 workers suggest that in this period the concentration

<table>
<thead>
<tr>
<th>Year</th>
<th>Enterprises &gt;19 employees (arithmetic average)</th>
<th>Florence median (number of employees)</th>
<th>Average number of employees in the largest 100 enterprises</th>
<th>Average number of employees in the largest 1000 enterprises</th>
<th>Percent of employees in firms with more than 999 enterprises</th>
<th>Percent of employees in firms with more than 9999 enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958</td>
<td>154.2</td>
<td>286</td>
<td>59829</td>
<td>13288</td>
<td>40.9</td>
<td>23.6</td>
</tr>
<tr>
<td>1963</td>
<td>150.3</td>
<td>334</td>
<td>67600</td>
<td>14785</td>
<td>42.1</td>
<td>24.9</td>
</tr>
<tr>
<td>1967</td>
<td>155.5</td>
<td>443</td>
<td>87441</td>
<td>17894</td>
<td>44.5</td>
<td>28.1</td>
</tr>
<tr>
<td>1972</td>
<td>147.2</td>
<td>409</td>
<td>93332</td>
<td>19306</td>
<td>44.1</td>
<td>28.0</td>
</tr>
<tr>
<td>1977</td>
<td>148.8</td>
<td>421</td>
<td>98214</td>
<td>20842</td>
<td>44.2</td>
<td>28.0</td>
</tr>
<tr>
<td>1982</td>
<td>143.5</td>
<td>346</td>
<td>101695</td>
<td>22085</td>
<td>42.9</td>
<td>26.8</td>
</tr>
<tr>
<td>1987</td>
<td>142.5</td>
<td>331</td>
<td>99558</td>
<td>23868</td>
<td>42.1</td>
<td>25.4</td>
</tr>
<tr>
<td>1992</td>
<td>144.1</td>
<td>358</td>
<td>84448</td>
<td>23896</td>
<td>42.3</td>
<td>24.4</td>
</tr>
<tr>
<td>1997</td>
<td>147.9</td>
<td>430</td>
<td>96973</td>
<td>27644</td>
<td>43.3</td>
<td>25.7</td>
</tr>
</tbody>
</table>

* For all but 1997 these series are based on estimations described in the text. The underlying data come from US Department of Commerce, Census Bureau, Enterprise Statistics, various years and, for 1997, from a special tabulation of the Census Bureau. These data include only employment within the US.
of employment in the largest enterprises also began to decrease, although the level at the starting point of the series has not yet been reached. 8

Why did enterprise size decrease from the early 1970s through to 1992? This was, of course, the period when investment in the new information technology began to take off as American producers of goods and services started to become computerized. It was also a time when the “back to basics” movement in management practices began, which led to a selling off of some parts of enterprises that did not fit well with the main lines of business. This divestment movement may also have accounted for the great changes in rank ordering of the largest industrial companies. Some also argue that in this period technological change with a labor-saving bias was also greater for the largest firms, although the evidence on this matter leave much to be desired.

The 1997 data reveal a reversal of this downward pattern and show an increase in each of the six measures of average enterprise size. This seems clearly a short-term result of the merger tsunami. It can be argued that in the long-term the largest firms will either divest themselves of parts of their enterprise which they cannot manage well or will grow more slowly than smaller firms. In such cases another undulation in these data series may occur. But one key fact about the current merger activities must be kept in mind: In contrast to previous merger waves which featured vertical or conglomerate mergers, 75 percent of the current mergers have occurred between companies that produce in at least one of the same 4-digit industries (Pryor, 2000b). The horizontal nature of these mergers makes divestment much more difficult in the future so that enterprise size may increase as long as mergers remain at a high level.

To begin to dig underneath these empirical results, two questions need immediate answers: To what extent is the change in size of American enterprises due to a shift in the distribution of production toward the service sectors, where firms are smaller? To what extent is the change in firm size attributable to changing costs of production or coordination?

I base the calculations in Table 3 on the assumption that the total number of workers remained the same in each year and that the sectoral composition of these workers was the same as in the base year. In this simulation the percentage distribution of the labor force by firm size in each sector, as well as the average size of enterprise in each size category in each sector remains the same.

Using 1958 as the base year, most of the size indicators show an increase in average enterprise size between 1958 and 1977, followed by a slight decline thereafter. These are roughly the same qualitative results as shown in the previous table. Using 1992 as the base year, the results are more mixed. A majority of the indicators show an increasing average size throughout the entire period, particularly in the earlier years.

In all cases the percentage increases in enterprise size between 1958 and 1977, as well as between 1977 and 1992, are greater when the sectoral structure of employment is held constant. This is because the structure of employment changed over the 35-year period toward those branches of production such as services, where the average enterprise size is smaller. For the same reason, the decline in enterprise size after 1977 is much less dramatic in the constant employment structure calculations than when no consideration is taken of the changing sectoral composition of labor. In brief, at least some of the noise about declining

8 The Pareto coefficients reveal the same pattern and are presented on my website.
Table 3
Various measurements of enterprise size for all sectors holding employment structure constant*  

<table>
<thead>
<tr>
<th>Employments weights</th>
<th>Enterprises &gt;19 employees (arithmetic average)</th>
<th>Florence median (number of employees)</th>
<th>Average number of employees in the largest</th>
<th>Percent of employees in firms with more than</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 enterprises</td>
<td>1000 enterprises</td>
<td>999 employees</td>
<td>9999 employees</td>
</tr>
<tr>
<td>1958 data on enterprise size</td>
<td>154.2</td>
<td>137.7</td>
<td>286</td>
<td>99</td>
</tr>
<tr>
<td>1977 data on enterprise size</td>
<td>159.5</td>
<td>138.8</td>
<td>664</td>
<td>246</td>
</tr>
<tr>
<td>1992 data on enterprise size</td>
<td>157.2</td>
<td>141.1</td>
<td>627</td>
<td>358</td>
</tr>
</tbody>
</table>

* Eight major sectors are used in the constant-employment-structure indices. For sources of data and other information, see Footnote 4.
average enterprise size can be traced to a changing structure of employment, rather than forces occurring within the enterprises because of the revolution in information technology. Although sectoral data for 1997 are not available for this study, the structure of production did not change greatly from 1992 so that the increase in enterprise size reflects almost exclusively the changes occurring within enterprises, most likely the result of mergers.

To understand more exactly the impact of information technology, it is also important to investigate whether the trends in enterprise size were due to changes in organization or production costs. Table 1 presents data on the ratio of establishments to enterprises, which is driven in part by changes in organization costs. On the production side, one impact of information technology can be seen in the changing average size of establishments.

At this point a data problem arises because the establishment data in the Enterprise Statistics are arranged by sector of parent company and not by what the establishment is producing. Furthermore, as noted above, this data source omits certain sectors up to 1992. To circumvent this problem, we can employ a different data base, namely data on establishments collected in various editions of County Business Patterns, which classify establishments according to their own production. It should also be noted that the two sources differ somewhat both in coverage and in definition of establishment. Furthermore, for service sector establishments certain estimates also had to be made for the early years to make the series comparable. For this analysis it is not necessary to worry about the concentration of production into ever fewer establishments, so I have estimated only four measures of size. Table 4 presents the results of these calculations, along with some much rougher estimates for the 1953–1959 period.

Almost all measures of establishment size show an increase up to the early 1960s and a decline thereafter until the 1990s when the series appears, perhaps temporarily, to level off. The same result obtains when the sectoral composition of the labor force is held constant, an exercise presented on my website. Thus we conclude that this size decline is real and, unlike the enterprise data, does not reflect as much the changing sectoral composition of employment.

As a result of these descriptive exercises we can distinguish four phases in the changing size of enterprises since the 1950s. (a) From the late 1950s to the early 1960s, enterprises increased in size as both establishments and the ratio of establishments to enterprises increased. (b) From the mid-1960s to the mid-1970s, enterprises increased in size since the

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9The underlying data from the County Business Patterns are not quite consistent. Prior to 1978 the published statistics came from administrative records for the Federal Insurance Contributions Act (FICA) and excluded workers not covered by Social Security. From 1978 to the present, the published statistics come from all establishments filing a Treasury Form 941 and cover all workers in establishments, where at least some are covered by Social Security. This change is said to have an impact, for instance, on coverage of workers in hospitals and educational institutions, but I could make no adjustments for these changes.

For the estimates for the entire economy, the series for the number of establishments and their average size that are made from the Enterprise Statistics and from the County Business Patterns differ by less than 4 percent for the period from 1967 through 1982 with the exception of 1972. In 1987 and 1992, when the least amount of estimating had to be carried out for both series, the former data show roughly 11.5 percent fewer establishments than the latter. This suggests that the estimates in Table 4 may have a downward bias up to 1982, which would only make the decline in establishment size less dramatic than is shown in Table 4. Such a bias also means that the early rise of the establishment/enterprise ratio may be overstated and, as a result, the leveling off of this ratio in the late 1980s was not so marked.
Table 4
Various measurements of sizes of non-agricultural private establishments in all sectors, 1953–1997a

<table>
<thead>
<tr>
<th>Year</th>
<th>Establishments &gt;19 employees (arithmetic average)</th>
<th>Florence median (number of employees)</th>
<th>Percent of employees in establishments with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less than 20 employees</td>
</tr>
<tr>
<td>1953*</td>
<td>109.6</td>
<td>113</td>
<td>26.2</td>
</tr>
<tr>
<td>1956*</td>
<td>105.0</td>
<td>100</td>
<td>27.4</td>
</tr>
<tr>
<td>1959*</td>
<td>101.0</td>
<td>91</td>
<td>28.3</td>
</tr>
<tr>
<td>1962</td>
<td>101.3</td>
<td>99</td>
<td>27.0</td>
</tr>
<tr>
<td>1967</td>
<td>102.7</td>
<td>112</td>
<td>24.7</td>
</tr>
<tr>
<td>1972</td>
<td>96.7</td>
<td>102</td>
<td>24.4</td>
</tr>
<tr>
<td>1977</td>
<td>92.2</td>
<td>78</td>
<td>26.9</td>
</tr>
<tr>
<td>1982</td>
<td>88.4</td>
<td>74</td>
<td>26.6</td>
</tr>
<tr>
<td>1987</td>
<td>83.6</td>
<td>69</td>
<td>26.8</td>
</tr>
<tr>
<td>1992</td>
<td>83.8</td>
<td>70</td>
<td>26.7</td>
</tr>
<tr>
<td>1997</td>
<td>84.3</td>
<td>76</td>
<td>25.3</td>
</tr>
</tbody>
</table>

a The asterisks mark those years for which the estimates are very approximate since only the number of establishment in each size category were given. Estimation methods are described in the text. The underlying data come from US Department of Commerce, Census Bureau, County Business Patterns, various years, and have been adjusted for comparability to cover the entire private sector excluding agriculture.

The ratio of establishments to enterprises increased faster than the declining size of establishments. (c) From the mid-1970s through 1992, establishments decreased slowly in size, the ratio of establishments to enterprises leveled off, and overall employment turned toward those sectors with smaller enterprises. (d) From 1992 onward, enterprises increased in size because of the merger tsunami, while the establishment/enterprise ratio and the size of establishments remained roughly constant.

Although our preliminary conclusion of declining employment size of enterprises still holds, the underlying causal forces rule out a simple interpretation. The approach emphasizing information technology, for instance, does not explain why organization costs are changing in a manner that the ratio of establishments to enterprises has leveled off or why, when the structure of employment is held constant at the 1992 level, the average enterprise size appears to be increasing by most measures. The approaches offered by those focusing on increasing returns to scale or random dynamic processes also do not prove helpful.

Because of the many estimates needed to obtain consistent time-series, even the simple empirical analysis presented above must be interpreted cautiously. It is possible, however, to obtain some additional insights by comparing these data to several other data series that focus on the international activities of domestic firms and the sizes of foreign enterprises.

5. Employment in large firms at home and abroad

The census data used up to now refer only to enterprises within the United States, regardless of whether they are US or foreign owned. By comparing statistics of enterprise size with the Fortune magazine database of large companies, which include the worldwide
activities of all American firms, we can gain some insight on the activities of US companies abroad.

We must, however, proceed cautiously with such an exercise for three reasons: First, the Fortune list of US firms does not include foreign owned companies operating in the United States. Second, up to the mid-1990s the Fortune list only includes publicly traded industrial enterprises (manufacturing and mining), so that we can only focus on these sectors if we wish to make time-series comparisons covering several decades. Third, the ranking of domestic firms by employment size may be quite different if their employment abroad is taken into account, so the two lists of size rankings may contain different firms. This may not be so serious for the top 100 firms since anecdotal evidence suggests that most have branches abroad. For smaller firms, however, this is far from assured so that it seems prudent to focus only on these 100 largest industrial employers. Table 5 presents some estimates of average employment of firms operating within the US.

The table shows that the average size of the 100 largest industrial firms in US follows the same pattern as all domestic enterprises up through 1992, namely an increase in average employment up to the early 1980s and then a decrease up to 1992. Comparison of the Census and the Fortune data show that foreign employment in domestic firms has become increasingly important, which is a well-known feature of the globalization process. The strange dip in this percentage in 1982 cannot be explained, but may be due to different rates of discharging workers at home and abroad in this recession year. In particular, foreign employment in US petroleum and capital goods firms are said to have considerably declined at that time.

The last two data columns provide a key international comparison of the largest 100 non-US enterprises and their ratios to similar US firms. The largest non-US enterprises are larger than their US counterparts for several reasons.

1. The non-US companies come from an economic area considerably larger than the US. Since large economic areas feature more large companies (the top 100 firms in US have a larger average size than the top 100 firms in Pennsylvania), we would expect the average abroad to be larger than in US.

2. In many foreign countries, firms have less desire or experience greater problems divesting themselves of particular branches or splitting themselves up for greater efficiency. Furthermore, because of differences in labor laws, enterprises outside the US have also not been able to downsize rapidly, particularly after mergers when redundant activities are eliminated. If this argument is correct, then many large non-US enterprises exceed the optimal size and only under extreme economic duress, for instance, the current recession in much of the world, will they begin to reduce their total employment, either through downsizing, divestment, or liquidation.10

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10 In 1998 and 1999 the US business press (for instance, Business Week, March 15, 1999) featured a number of articles reporting the financial difficulties of some of the well-known Japanese keiretsu such as Misubishi, Fuyo, Mitsui, Sumitomo Dai-ichi Kangin and Sanwa. A number of Korean chaebol are experiencing great difficulties as well. Whether these problems presage a general breakup of these companies and company groups remains to be seen. In certain circumstances, they could lead to even larger enterprises in the world if large non-Japanese firms purchased some of these troubled companies, as presaged by the large share of Nisson that was purchased by Renault in the early months of 1999 or the DaimlerChrysler purchase of Mitsubishi Motors in early 2000.
Table 5
Some data on large firms from an international perspective

<table>
<thead>
<tr>
<th>Year</th>
<th>United States firms</th>
<th>Non-US firms, fortune data (average total employment)</th>
<th>Comparison of fortune data (ratio of average size of 100 largest non-US to 100 largest US firms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Census data (average domestic employment)</td>
<td>Fortune data (average total employment)</td>
<td>Ratio (total to domestic employment)</td>
</tr>
<tr>
<td>1963</td>
<td>53678</td>
<td>63848</td>
<td>118.9 percent</td>
</tr>
<tr>
<td>1972</td>
<td>72879</td>
<td>88331</td>
<td>121.2</td>
</tr>
<tr>
<td>1982</td>
<td>76394</td>
<td>88415</td>
<td>115.7</td>
</tr>
<tr>
<td>1992</td>
<td>55073</td>
<td>78032</td>
<td>141.7</td>
</tr>
<tr>
<td>1997</td>
<td>n.a.</td>
<td>77547</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Panel A: the arithmetic average size of the largest 100 industrial enterprises

Panel B: the arithmetic average size of the largest enterprises, all industries

* The census data come from various issues of Enterprise Statistics and, for the industrial firms, include only firms in mining and manufacturing. They may include some foreign firms, but only their employment in the United States. The statistics in the table are calculated in the same manner as the data in previous tables for all enterprises. The Fortune data come from various issues of that magazine and, as discussed in the text, classify enterprise by country of predominant ownership, not location of employment. As also mentioned, they are not completely comparable with the data from Enterprise Statistics. Both sets of data include firms classified as industrial that may carry out considerable non-industrial activities. Thus the classification of large conglomerates is problematic.
3. Outside the US many governments have encouraged mergers, particularly of large firms, to serve as “national champions.” Although the effectiveness of such a tool of industrial policy to “increase national competitiveness” is doubtful, this ideology is still strong. Moreover, anti-trust and other regulations inhibiting the growth of enterprises are not as strongly enforced abroad as in US. In some countries very large state enterprises have also increased in size by taking over bankrupt private firms as a means of maintaining employment.

4. The close alliance of banks with enterprises in certain countries (for instance, the keiretsu in Japan) has served to encourage the rapid employment growth of large companies, particularly as certain industries become consolidated and as many of these enterprises deepen their vertical integration.

5. The industrial environment in US is different than in other countries and this encourages a different type of growth pattern of firms. For instance, the unique US capital markets provide access to investment funds to small and medium size firms that allows them to grow rapidly, particularly in situations when established industry leaders have troubles in recognizing new markets that are opened by new technologies. A well-known example was the fall of IBM from its dominant position as the personal computer began to displace mainframe computers and both new and medium size companies began to expand rapidly. Although most public attention in US is focused on the dramatic cases when a small company grows rapidly to dominate an industry, for instance, Microsoft, the more important action may take place in the movement between middle-size and large-size enterprises. To illustrate this point, Tables 3 and 5 show that the top 100 US firms have decreased somewhat in average size between 1977 and 1992; however, the next largest 900 companies have increased in average size. The institutional environment in other capitalist countries may not allow such a dynamic to occur so that when such technological changes occur, the established firms do not face so many upstart competitors and, as they finally master the new technology, grow increasingly larger.  

Although these conjectures are interesting, we cannot be sure about which of these — or possibly others — provides the most important explanations without rigorous statistical testing. This is, unfortunately, an extremely difficult task lying outside the scope of this essay. Nevertheless, resolution of this puzzle is important, because if none of these conjectures has much explanatory power, then we must ask if the rest of the industrial world is showing a trend that may soon appear in America. If this is the case, then we may well end up working for the giant enterprise sometime in the future. On the other hand, if US represents the future, then the industrial structure outside the US may well change. Of course, it is also possible that the size distribution of enterprises in US and other industrial nations will not

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11 I am grateful to Richard R. Nelson for a conversation about this point. His recent Tinbergen lecture “The Sources of Industrial Leadership: A Perspective on Industrial Policy” develops some of these ideas in greater detail.

12 Audretsch (2000) presents a fascinating summary of some such differences between the United States and Germany. The study of the institutional support for particular industrial activities is only beginning and promising examples include Nelson’s (1988) study for the R&D sector and Storey’s (1994) analysis of the small business sector.
converge because of differences in the legal and social environments so that the rest of the world will work in giant enterprises, while the US will not. A key factor is how long the current merger wave, both in the US and abroad, will last.

6. Final remarks

This essay has tried to present some stylized facts about the changing size of enterprises in America in the 40 years since the late 1950s, although data difficulties prevent complete certainty about the results. Inferences drawn from Marx and Schumpeter about ever increasing enterprise size appear correct, but only for some industries and not for the entire productive sector — at least in the United States. Further, as noted above, such predictions might be correct, but not for the reasons that they offered. Gibrat’s approach appears unpromising, primarily because the data do not confirm one crucial implication, namely that share of employment of the largest enterprises increases. The information technology perspective offers some useful and probably valid reasons for declining establishment size. Unfortunately, this approach is not very useful in helping us understand the increasing size of enterprises in some US industries.

Moreover, without a more detailed statistical analysis, it is difficult to isolate the most important causes of trends in enterprise size, and the undulating pattern of enterprise size does not make this task any easier. Assuming that the present merger tsunami ends in a few years, it does not seem that most of us will be working for giant enterprises in 2028, if only because of the changing industrial structure toward sectors featuring smaller size firms. Furthermore, any prediction of this nature must take into account four additional and critical uncertainties.

1. After investment in the new information technology has run its course — say in 2015 — the older trends of increasing enterprise size may reassert themselves again. In part, the trends in changing enterprise size are based on changes in technology, and technological forecasting bears a close affinity to the reading of tea-leaves, as Schnaars (1989) empirically demonstrates.

2. Firms may reach limits in the degree to which certain activities can be outsourced because of risks arising in certain functions such as quality control. At this point, their employment size may again begin to increase.

3. Since trends in US and the rest of the industrial world are somewhat different and cannot yet be fully explained, our knowledge on which to base any extrapolations about firm size leaves something to be desired. An important first step is to clear up the puzzle about different trends in US and the rest of the industrial world.

4. Size, as measured by employment size, may become an increasingly irrelevant indicator as firms turn to industrial alliances as a source of growth. For instance, Friedheim (1998) presents evidence for the top 1000 public US corporations that in 1980 about 1 percent of their revenues came from alliances; in 1990, about 8 percent. In 2000 he projects this to be roughly 20 percent. Therefore, we might be working for giant corporations and not

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13 Friedman does not present his exact sources (some of the data come from internal memoranda from Booz–Allen Hamilton) nor how he adjusted the data, so such figures must be taken with caution.
know it because the source of their size lies in their agreements with other enterprises, both here and abroad.

Although the future is cloudy, one conclusion is certain. Much closer policy attention needs to be paid to current merger activities before the process even more spirals out of control.

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Further reading


References


