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On the evolution of firm organization, SMEs and economic growth in the USA and Japan

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Abstract

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Keywords

evolution, firm, organization, SMEs, economic, growth, USA, Japan

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5. On the evolution of firm organization, SMEs and economic growth in the USA and Japan

Elias Sanidas

5.1 INTRODUCTION

The evolution of the organization of firms throughout history has only recently been extensively analysed. This evolution, especially in countries like the USA and Japan, is important to know and understand for many reasons, and in particular for its contribution to economic growth. This contribution is broadly the main theme of this chapter. However, there are generally two types of firms to explore, the large ones and the not so large. Thus, the total number of firms in a national economy includes the large enterprises (LEs), very often vertically integrated and multi-divisional, the medium-sized and the small firms (the latter two are often named SMEs). Researchers such as Chandler (for example 1977, 1986, 1990) and Schumpeter (for example 1950) have extensively analysed the positive role that LEs have historically played in the economic growth of nations like the USA and Germany, and of industries like oil and chemicals.

More recently, considerable interest has been shown in the role that SMEs have been playing in shaping national economies.¹ This renewed interest is mainly due to the fact that in many countries, from the 1980s onwards, small firms have been playing an increasingly important role in economic growth.² In this chapter, an attempt will be made to synthesize the importance of all types of firms, under the umbrella of the total number of firms in an economy, in explaining differences in economic growth amongst the most-developed nations today. SMEs represent a high proportion of the overall number of firms in most countries, about 99 per cent;³ consequently any conclusions drawn on the total number of firms will also be applicable to SMEs.

At the same time, reference will be made to competition. One of the characteristics of strongly competitive markets is the large number of producers and their inability to influence prevailing prices. This characteristic

will be utilized in this study to provide evidence for the contention that stronger competition entails stronger economic growth at both the macro and micro levels. Similar findings have recently been reached by various researchers.⁴ In addition, the comparison of the historical evolutions of the Japanese and the American firm will be used as evidence that countries where stronger competition exists will grow faster than in others where oligopolistic and monopolistic elements are more prevalent.

In the process of explaining the differences in economic growth amongst the most-developed nations today, elements of organizational innovations will also be included. These elements are necessary to include in this analysis because economic growth is not just about growth in investment and embodied technological change. This will become more apparent in sections 5.2 and 5.3 below. Economic growth will be further examined in section 5.4 and will be tested econometrically in section 5.5.

More precisely, sections 5.2 and 5.3 will deal with a historical examination of firm evolution in Japan and the USA respectively. Without such a trip to the past, it is impossible to properly evaluate the present form, structure, quality and quantity of firms in these two countries. In section 5.4, a comparison between the two evolutions will be examined and conclusions drawn. In section 5.5 an econometric model will give evidence to the previous sections and more relevant conclusions will be evaluated. In section 5.6 the implications for the economies of East Asia will be discussed. Finally, in section 5.7, a summary of some of the major conclusions from this study will be separately developed.

5.2 EVOLUTION OF THE JAPANESE FIRM

5.2.1 Japanese Economics of Scope and Decentralization of Decision-making

Several scholars have produced a detailed historical evolution of the Japanese economy as well as of the Japanese firm.⁵ In this study I will synthesize the relevant parts of Fruin's (1992) Chandlerian historical analysis of Japan's spectacular economic development. This author distinguishes three types of enterprises which have made their presence felt, namely the *zaibatsu*, the independent urban firms, and the independent rural firms. Most of the studies have concentrated on the first type, and admittedly the most prominent in shaping Japanese industries in a decisive way.

The privatization process that took place in the second stage of the Meiji Restoration, after 1885, was not smooth, leading to the particular set of traits that the *zaibatsu* acquired during this period. Indeed these groups

became, from that starting point, a collection of mostly unrelated commercial, industrial and service enterprises which were family owned and for a while family managed. To use a modern term they became conglomerates, and they had to find a way to create interdependence between themselves.

Consequently, from this early period, for this type of enterprise, a situation of joint production and distribution occurred, generating economies of scope. As Fruin (1992) remarked: 'In Japan, *zaibatsu* grew for the most part by unrelated diversification, which is to say that economies of scale in production and distribution were not the forces behind the development of national or *zaibatsu* business groupings' (p. 90). Unrelated diversification was a salient feature of these groupings before the 1930s. The initial clusters were transportation (mainly in shipping), energy production and finance. Manufacturing was crafted onto these initial activities. The extent to which the interrelated constellation of firms was effectively coordinated, contributed to the lowering of costs. For example, this coordination was obvious where raw materials had to be sourced overseas, paid for and insured, shipped to Japan, stored, shipped again, processed and then distributed, thus making the non-manufacturing segment of the value added chain quite extended. Furthermore, when some economies of scale were also realized, they were in intermediate product markets.

Economies of scale did not take place until the boom period of the First World War, and in a more extensive way until the late 1950s. 'In Japan before World War II (WW2), indeed before the late 1950s, the domestic and proximate East Asian markets for volume goods were not large, and it was extremely risky to compete on the basis of economies of scale in most instances' (Fruin, 1992, p. 113). Some sustainable scale economies were present before the First World War only in some industries, such as textiles, paper, some metals production, food (sugar, beer, milled grains), beverages, some chemicals, and cement. However, only textiles were exported in bulk, thus realizing more economies of scale.

A significant corollary of the importance of economies of scope present in this early Japanese industrial development, is the nearly universal separation of production and distribution' (Fruin, 1992, p. 109). Thus, countless specialized trading companies existed at the same time as some bigger general trading firms, which were part of the largest *zaibatsu*.

The parallel existence of these two phenomena – first, the divorce between distribution and production, and second, the economies of scope – had another consequence: the non-existence of organizational centralization. Consequently, Japanese firms of this period had a non-complex U-form organizational chart. The Japanese holding companies concentrated managerial resources in factories and at the lower level of the firm, and consequently they did not act as a capital market to allocate funds to subsidiary

enterprises. Even the most managerially advanced companies, the textile ones, retained a relatively simple form.

Although *zaburva* firms played a central role in Japanese economic development, the independent enterprises were more numerous, widespread, and diversified in terms of their activities. They were also more important given their estimated two-thirds to three-quarters contribution to the nation's domestic manufactured product' (Frum, 1992, p. 119).

Thus, without the natural resources of many Western nations, Japan was going to further reinforce its existing strategy of creating this unique organizational system. One main message is repeated, when analysing Frum's detailed study (1992, for example Chapter 5). That is, Japanese firms did not grow very large compared with Western companies. Instead they specialized their production in mainly one or two products at the most, and they concentrated their organizational activities within the factories, thus avoiding centralization and accentuating inter-firm networks. The product-focused, inter-firm networks were transformed into large outsourcing groups of enterprises as indicated by a percentage of manufacturing value added. Consequently, vertical integration was low and a large network of product-based firms was already in place in Japan during the inter-war period.

Furthermore, horizontal integration, through mergers and acquisitions, especially in textiles, paper, agricultural chemicals, and machinery, frequently led to concentration of resources at production sites and decentralization. This also meant a gradual multifunctional organization of business, starting with a single function such as sales or purchasing or production and then gradually combining these single functions horizontally. Thus, the tendency to specialize in form and function led to interdependence of firms at the same time.

5.2.2 Focal Factories and Sub-contracting

Decentralization of management decisions amounted to the development of what Frum calls focal factories, which

duplicated locally the growing complexity in managerial functions found at the apex of the corporate hierarchy. Within focal factories, a panoply of corporate functions could be found: quality-assurance offices, marketing and sales staff, research facilities, and even personnel departments. Factory managers, like company presidents, were enveloped by a hive of clerical and technical specialists. . . . Focal factories were charged not only with labour management but also with technology transfer, product and process innovation, engineering, manufacturing, cost accounting, new personnel policies, regional distribution, and sales co-ordination . . . (Frum, 1992 p. 136)

Why has this focal factories system evolved so strongly in Japan? Several reasons can be detected from Frum's analysis. First, there was, from the end of the nineteenth century, a process of trial-and-error adaptation of Western knowledge and technology, which found a fecund area for development in small decentralized local and autonomous firms. The time and economic uncertainty constraints made this process even more necessary in such firms. Second, the economic downturn, following the First World War and defence cuts, caused widespread lay-offs among military arsenals and civilian shipbuilders. This large pool of skilled and semi-skilled underemployed or unemployed workers became the labour pool of many small subcontractors who became suppliers to large firms between the mid-1920s and the beginning of the 1930s. Third, and as corollary of the second reason, larger firms used the smaller subcontractors, also because of their lower wages.

Fourth, factories were not producing for the national market but for regional or international markets. Fifth, cost accounting methods were not well developed. Sixth, the well-established regional traders and middlemen prevented companies from centralizing and coordinating relevant functions. This was especially true in textiles, cement, food and beverages, which considered together accounted for 53 per cent of the 200 largest industrial firms in 1930. Seventh, there was no anti-trust legislation to prohibit interlocking business alliances and hence small local firms could exist independently and yet be at the same time part of a bigger group such as the *zaibatsu*.

Eighth, alliances in manufacturing and distribution by small focal firms minimized risks while taking advantage of the production and distribution resources that other firms commanded: 'a strategy of maximising inter-firm economies of scope through group-driven cooperative transactions made better sense than the pursuit of internal production and allocative efficiencies through vertical integration and product diversification' (Frum, 1992, p. 157). Ninth, the performance of focal factories, being strongly correlated with the existence and intensity of inter-firm networks, suggests that there were substantial savings in transaction costs and diseconomies of managerial control. Tenth, the lower price-cost margins of small firms were also due to them pursuing a strategy of producing in distinct niches and thus offering dynamic complementarity (Audretsch et al., 1999).

Besides Frum, Best (1990) tells us a similar story:

When the Japanese firms first penetrate foreign markets they often find that they are competing against firms with an array of product lines. But instead of competing with a similar array, the Japanese competitor focuses on the high volume segment and establishes a production facility that minimises complexity. This strategy is based upon the fact that manufacturing overheads in Western companies are usually between 150 per cent and 250 per cent of direct labour costs . . . (p. 142)

Hence, by focusing on a small number of product lines, Japanese firms greatly reduced costs and consequently they were able to substantially undercut prices (see also Abegglen and Stalk, 1985).

There were some alternatives to this system. For instance, an early integration of mass production and distribution was the strategy of the Matsushita electric company, which was founded in 1918. However this was an exception rather than the rule.

An extension of the focal factories is found in subcontracting and outsourcing. Parent or generally larger companies have established with suppliers, or generally smaller firms, two types of subcontracting: an informal one according to which written contracts are non-existent, and a formal one. A set of 'shared network norms' was established over time in the former one and a trusting relationship developed. In addition, there was a continuous transfer of organizational and technological innovations from the big *kaisha* firms to the smaller ones, though the latter did not benefit in every respect from this cooperation (for instance not in terms of wages).

Within the subcontracting system, special emphasis was given to the component design, which, depending on the relative independence of the smaller firms, maximized technological innovations. Following Best's analysis (1990, p. 164), three types of component design relationship between automakers and parts makers can be identified:

1. 'The automaker provides blueprint specifications to a range of potential part makers, each of whom submits a price bid.'
2. 'The automaker supplies blueprint specifications but expects the parts maker to suggest alterations in the development process.'
3. 'The automaker does not provide blueprint specifications but only component performance requirements. Here the parts maker is expected to have an independent design capacity and be able to solve problems jointly with the automaker ...'

The second and third types of supplier relations are much more networked than the first, and are more of a Japanese organizational innovation that has been successful in promoting new technologies combined with high quality. This innovation has gradually penetrated other industries as well. As Whitaker (1994) tells us, in 1987, 55.9 per cent of SMEs did some form of subcontracting, though at a decreasing rate from 1981.

After the Second World War, the complicated system of Japanese firm networks between *zaibatsu*, or between the latter and non-*zaibatsu*, was replaced only in name by the even more intensified network of *keiretsu* and non-*keiretsu*. Overall, and by and large, the system has not changed much: a huge number of establishments, especially small ones, still exist and have

survived despite the recent prolonged recession, all of them intertwined with each other in a cooperative way.

Furthermore, after the Second World War the Japanese large firms, such as Toyota, introduced a few unique organizational innovations. These were the just-in-time (JIT) production and inventory process, the automated and flexible manufacturing system (AFMS), adaptable product development (APD), process efficiency, extended quality control and so on (see for instance, Best, 1990; Abegglen and Stalk, 1985; and McMillan, 1984). All these innovations reinforced the dual cooperative system of *keiretsu* and big firms cum SMEs.

Indeed Western researchers on the Japanese economic miracle from 1950 to 1990 have repeatedly observed that there is cooperation in all levels of Japan's society, for instance between workers and managers, between government agencies and firms and so on: 'Japan's physical and geographical characteristics give social reinforcement to its social history of groupism, interdependence, and sense of *OX* and *GIRI* - debt and obligation.' (McMillan, 1984, p. 23).

5.3 EVOLUTION OF THE AMERICAN FIRM

5.3.1 The Start of Big Business, External and Internal Organization: Towards the Second Industrial Revolution

The development of the railway system coincided with the USA's economic industrial take-off period of the mid-nineteenth century. The most important achievement in the railways development was the appearance, for the first time in economic history, of the modern big business based on salaried managers to run multi-million dollar railway firms across the country (Chandler, 1977). These firms influenced, in the decades up to the end of the nineteenth century, many other enterprises in different industries in terms of their organization and management techniques. Famous entrepreneurs who played a marked role in innovating in their own business, were originally trained in the railway firms.

Together with the development of a national network of railways, there was a parallel development in telegraph, steamships and cable systems which all allowed for the first time in history a speedy and voluminous dispatch of various products in all parts of the vast country. This in turn paved the way for huge economies of scale and scope in existing and new industries during the second half of the nineteenth century.

Besides the railways expansion, another precondition for the second industrial revolution was the superabundance of land, combined with a

favourable inclination for entrepreneurship (Americans were always fascinated by the success of their business people), and a shortage of labour (McCraw, 1997; Habakkuk, 1962).

Big business through mass production began to gather steam in the 1870s and 1880s. Out of the Fortune 500 largest American firms in the mid-1990s, 53 were founded in the 1880s (for example Kodak, Johnson & Johnson, Coca-Cola, Westinghouse Electric), 39 in the 1890s (for example General Electric, PepsiCo, Goodyear), and 52 in the 1900s (for example Ford Motor, Gillette, General Motors) (the source of this count is Harris Corporation, 1996).

In the 1880s and early 1890s, many small manufacturers in the sugar, leather, salt, distilling, linseed and cotton oil, biscuit, petroleum, fertilizer and rubber boot and glove industries joined by forming large horizontal combinations. The latter resulted mainly as a response to overproduction by numerous small firms in an expanding national market during the 1860s and 1870s, and hence a threatening situation of prices falling below production costs (Chandler, 1986, p. 10). The producer goods industries developed later. Until the depression of the 1890s, most of the combinations and consolidations had been in the consumer goods industries.

The American economy was consolidated and strengthened during the period 1890 to 1910 approximately (the core of the Second Industrial Revolution). This consolidation took place through the process of:

- Full integration of mass production and mass marketing (Chandler's thesis) for both the consumer goods and producer goods industries.
- Multifunctional hierarchical business organization (to some extent similar to that of the railway firms).
- A marked change in the organization of the shop floor (Lazonick's thesis, 1990).
- Appearance of big national and international corporations.
- Salaried managers took over in running big business from the founding entrepreneurs in an increasing way.
- Middle management and especially top management for the first time replaced market forces in an oligopolistic environment.
- The learned skills and knowledge within each oligopolistic market were company-specific and industry-specific.

Combinations and integrations in the consumer goods industries before 1897 had almost entirely been engineered and financed by the entrepreneurs themselves. On the contrary, after 1897, when the biggest merger movement in American economic history took place, outside funds played an increasingly significant role in industrial combination and integration.

Financiers and promoters began to acquire the same type of control over industrial corporations as they did earlier in the 1850s over railway firms.

Like the companies making consumer goods, those making producers' goods also set up nationwide and worldwide marketing and distributing organizations, consolidated production into a few large plants, and established purchasing departments. Also, except in steel, integration usually followed combination in the producers' goods industries.

Such large enterprises often led to diversification of the types of products these manufacturing companies made and sold. The 'full-line' strategy, pioneered by General Electric and Westinghouse, was soon adopted by many other consolidated concerns.

By the turn of the nineteenth century, large industrial firms became vertically integrated: forward into distribution and backward into supplies of inputs; also centralized and functionally departmentalized organizations. They became increasingly bureaucratic internally and oligopolistic externally, despite some tendencies for monopolies. Integration and combination by one manufacturer forced others to follow.

Following Chandler's analysis, still further reorganization of firms took place, this time internal in nature. The coordination and control of the flow of materials at a high volume and speed through many departments in which many workers were employed in each of the production processes created most challenging administrative and managerial problems in the second half of the nineteenth century. These problems became acute only in the late 1870s and 1880s but their solutions started taking place in the 1890s and 1900s.

During the years of expansion in the 1870s and 1880s, industrialists relied on skilled foremen to recruit, train and manage the workers. That was the 'inside contracting' system of labour organization, through which the owners eventually lost control over costs and the coordination of the flow of goods through the many departments.

H.C. Metcalfe, in 1885, prescribed a solution to the 'inside contracting' system. His solution was an adaptation of the voucher system of accounts developed in railway repair shops to the needs of interchangeable-parts manufacturing. H.A. Towne, F.A. Halsey and other metalworking manufacturers subsequently developed the 'gain-sharing' system. However, a further suggestion came from F.W. Taylor who, in 1895, pronounced his 'scientific management', according to which standards of premiums and bonuses paid should be determined 'scientifically' and not historically. American manufacturers rarely adopted Taylor's full system. Instead, they gradually, from the mid-1890s to the end of the 1900s, adopted and refined the line-and-staff organization which originally was invented by railway men in the 1850s.

There is another way of looking into these organizational innovations, which were directly linked to the relation between workers on the shop floor, and the management of the production processes. Skilled workers who played a central role in shop floor operations were transformed into lower managers; thus a valuable cooperation was gained from these transformed salaried employees. As Lazoniak said: 'making skilled workers members of the firm helped management to divide and conquer the labour force' (1990, p. 229).

All these internal organizational reforms further strengthened the power of the larger firms, which in turn accelerated their growth and at the same time the growth of the USA. As Chandler says: 'Kuznet's data support the assertion that the industries spearheading American economic growth were those dominated by a small number of large managerial enterprises' (Chandler, 1990, p. 226).

5.3.2 Diversification of Production and Reinforcement of Big Business: Reversal of the Trend from the 1980s

The interwar period was very turbulent with major recessions and booms, which eventually consolidated the structure of the American economy which was shaped before the First World War. The USA was already dominating the world economy before the outbreak of the Second World War. When the latter ended the American economy was even stronger and totally in control of the non-communist globe. It was not though until the late 1960s and especially the 1970s that the European and Japanese nations started threatening this American supremacy.

How did managers of the American firms respond to the then developing fierce competition? Chandler and other researchers have suggested that the American firms decided to expand through the process of diversification, either to a minor extent to related industries or to a major extent, for the first time, to unrelated ones. The diversification into unrelated industries led to the emergence of many conglomerates, an innovation of the 1960s for the Americans (Chandler and Tedlow, 1985, p. 739). This trend was reversed later in the 1980s, when consolidation and specialization took place again (Shleifer and Vishny, 1994).

In short, the American managers, via the third most important merger movement in their history, chose in the 1960s an easy way of making some extra profits, or at least conserving the existing ones, but they did not lower unit costs of various products via economies of scale, as they so successfully did during the Second Industrial Revolution.

In addition, diversification and multi-divisionalization went hand in hand. The continuous process of vertical and horizontal integration, as well

as product extension into additional industries during more than 100 years of American economic development, ended up in more and more multi-divisionalization, hence the proliferation of the M-form⁶ of American firms.

Finally, the propagation of American transnational firms (TNCs) in the world economy, their spreading-out into many nations and sectors through their tool of the 'visible hand' (for example transfer prices) certainly makes it possible to make the contention that the supremacy of the American TNC's further solidified the big-business trend of the American firm evolution.

However, a reversal towards smaller firms, and an increase in the total number of business concerns, started in the 1980s or even earlier (see for instance Table 1.3b of the 1997 OECD report; or Harrison, 1994). This reversal can be described as follows.

The new information technology introduced in the 1950s expanded in the 1960s, but really took off in the 1970s. It allowed the appearance of flexible and programmable machines, which can be used for not just one task but for a whole set of tasks. These machines can extend Tayloristic organization of labour from mass production to the production of small lots and even single products. Consequently: 'Corporations would be run as networks of establishments often considerably smaller than the classical Fordist factory. Also, many forms of subcontracting, franchising and the like are used to a considerable extent to create formally independent units well integrated in such networks' (Ernst and Jaeger, 1989, p. 173).

Dicken (1992), and others also confirm this conclusion. For instance Chandler (1990, p. 607) says: 'In the 1960s and 1970s a wide variety of industries shifted from electromechanical to electronically controlled processes of production that began to transform the work place and alter the materials used in production. They realigned the economies of scale and scope, often reducing minimum efficient scale and at the same time expanding the opportunities for exploiting the economies of scope'.

The system of flexible specialization can be defined in broad terms as a vertical disintegration of some core industries or as 'the establishment of a much more independent network of small plants based on a work organization which as a complement to flexibility and specialization explicitly emphasizes professionalization' (Ernst and Jaeger, 1989, p. 176).

Harrison (1994) has argued for similar points in his attempt to explain 'the changing landscape of corporate power in the age of flexibility' in the USA. For instance, he mentions vertical disintegration and strategic downsizing of large conglomerates in order to capture the power of core competencies, as being two main factors for the proliferation of smaller firms.

Finally, the tendencies for disintegration and more specialization were also strongly related to the gradual adoption from the 1980s of the just-in-time cum quality control holistic system in an increasing number of American firms, thus further implementing the outsourcing system (Samidas, 2001). Accordingly, it seems that such an adoption played an even larger role than other factors just mentioned in the paragraphs above, mainly because the lean system or its equivalent of JIT/QC system is holistic in nature and it involves all aspects of the firm such as all employees and managers, engineering designs, strategies, and so on.

5.4 A COMPARISON BETWEEN THE JAPANESE AND THE AMERICAN EVOLUTION OF FIRMS. COMPARISON WITH OTHER COUNTRIES AND RELATION WITH ECONOMIC GROWTH AND COMPETITION

From the very brief historical trip to Japan and the USA, some conclusions can now be readily made regarding the comparison between the American and Japanese evolutions of firms.

In Japan, smaller and more numerous firms has been the trend from the beginning of the country's industrialization process. This was due to the early development of the focal type of company because of limited resources and technology, hence the search for cooperation and consequently economies of scale to the detriment of economies of scale. In the USA we have seen a contrary evolution take place, in which there was a tendency from the beginning of the country's industrialization process for the creation of big business, diversification of products, and eventually multidivisional organization. This was due to a natural abundance of resources, human and non-human, plus a series of major and minor technological and organizational breakthroughs. This divergent historical evolution of the firm in the two countries demonstrates that there is not a unique way to evaluate competition and the role of SMEs, but this evaluation depends on the historical context of factors such as availability of resources, technology and organization. In other words, what is good for the USA might not be good for Japan, or what is good for Japan might not be good for Canada, and so on.

Also, in Japan, many organizational innovations, such as the just-in-time cum quality control (JIT/QC) process⁷ and the Japanese style of subcontracting, enhanced and sustained the development of SMEs. On the contrary, in the USA, only very recently, from the late 1980s, has there been a reversal in the continuous expansion of big business to the detriment of

smaller ones. This is explained by the reorganization of the American firms, to take into account not only the immense possibilities offered by the huge development of information technology but, more importantly, the imitation of Japanese organizational practices centred around the JIT/QC holistic system. Otherwise, no other major organizational innovations took place in this country after the Second World War except an intensification of product diversification and multi-divisionalism.

In Japan, the conglomerate type of business existed from the start of the country's industrialization process and has continued its development up to the present. On the contrary, in the USA it only appeared in the mid-1960s, but its development was reversed in the 1980s. Again this antithesis between the Japanese and the American firm evolutions can be explained by differences in resource and technological endowments as well as historical circumstances.

An important conclusion is that in Japan we have a more competitive economic environment than in the USA. Here, stronger competition means that a buyer has a larger choice of suppliers or sellers in the economy. This can be verified mainly by considering the number of firms operating in each industry and in total. Table 5.1 in Appendix 5.1 shows this for 16 OECD countries. In each of the industries examined the Japanese competition is stronger than in any other country (although the data used are not consistent across countries, the comparison is revealing). On the contrary, the American industries are not as competitive, and they often tend to be more oligopolistic.

Porter (1990) has also analysed the degree of competitiveness in several countries, such as in Japan and the USA, when he talked about 'domestic rivalry'. However, he seems to indicate that oligopolistic competition is desirable, at least as an alternative to monopolies and oligopolies with only a few rivals. My argument is, rather, based on the relative importance of SMEs, which offer a more intensive competition than just a larger number of oligopolistic firms. Further evidence indicating that Japan offers a very strong competitive environment, even in the subcontracting sector, is provided by many other researchers such as Miwa (1994), Ito (1994), Watanabe (1997) and Fujimoto and Takeishi (1997).

As a consequence of all the analysis so far, the following theoretical model is proposed in order to explain differences in economic growth between the advanced nations. Figure 5.1 summarizes the main points.

Briefly, the schema tells the following story. First, the poorer the country the lower its average income and the more unsatisfied the demand for all goods is, which in turn generates more growth *ceteris paribus*. This is a necessary but not a sufficient condition for high economic growth. This is another way of expressing the controversial convergence theory of growth

Figure 5.1 Summary schema

(for the latter see for example Barro and Sala-i-Martin, 1995, or Jones, 1998 for a comprehensive review). The application of this condition to the two economies under study clearly shows that Japan's lateness of economic development, when translated into substantial unsatisfied demand, created a solid basis for higher economic growth than in the USA for most periods of the last century.

Second, another necessary but not sufficient condition for high economic growth is a continuous flow of minor and major managerial and technological innovations. This took place in both Japan and the USA, though in different ways, in different periods and in different intensities, as sections 5.2 and 5.3 have identified.

Third, another necessary, and perhaps sufficient, condition for high economic growth is competition and rivalry amongst domestic firms in all industries. Such competition, especially if accompanied by some cooperation and networking, enhances not so much economies of scale but economies of scope (not necessarily as joint production under the same roof and firm but as joint production in separate establishments, as explained in section 5.2). In turn, strong competition and economies of scope increase value added, which eventually leads to high economic growth. The chance of a larger number of companies creating a larger value added than a smaller number of enterprises is very high, since the various stages of production are increased with a larger number of firms. In other words, horizontal and, especially, vertical integration reduce the value added for a given product, especially in heavy manufacturing industries such as cars. In addition,

strong competition and a large number of production establishments are also closely related to the system of subcontracting.

How is this third condition translated in the two countries? In the USA the tendency for big business, vertical integration, mass production, formation of oligopolies and a limited number of firms has meant a slower economic growth than in Japan (*ceteris paribus*) over most of the last century. However, I should add that not all the Japanese industries are exposed to domestic and international competition, contrary to the American entire set of industries which have been exposed to international competition at least for a long time. This dual (two-faced) Japanese competition is perhaps the deep reason for the recent prolonged recession in the Asian country.

Fourth, economic growth and industrial organization depend on the scarcity or abundance of resources and markets. Thus Japan, with a relatively limited amount of resources, technology and markets at the beginning of its economic development, adopted a different mode of economic organization than in the USA, with its renowned richness in all these factors. This point of the relative abundance of resources will be taken up again at the end of this section.

According to the above conclusions, I will now attempt to separate the OECD (as of the year 1990) plus the East Asian countries (these two different groups constitute perhaps the most advanced economies in the world today) into two camps. In the Japanese camp, I will include all the East Asian countries, plus the poorest of the OECD ones, namely Spain, Portugal, Greece, Turkey, plus Italy with its rich North and poor South. In this camp the general characteristic is a dual system of some big companies with a big army of SMEs, which propel their economies in a dynamic way. Also in this camp there is a relative scarcity of natural resources, late development and a reliance on technological imitation. Finally, perhaps as a consequence of all these traits, these countries were the fastest-growing economies in the world (with minor exceptions) between the 1960s and the present (see the quantitative analysis in the next section).

In the American camp, I include Canada, Australia, New Zealand, plus all the Northern European countries including France. In this camp the general characteristics are virtually the contrary of the Japanese camp, that is a proliferation of big business, a long history of independent economic and technological development, and a slower economic growth between the 1960s and the present.

As a confirmation of my choices, I will briefly give some elements for two countries in terms of their firm evolution, namely Italy (of the Japanese camp) and Germany (of the American camp). Comparison with other countries will be made in the next section in a quantitative way.

Chandler (1990) has extensively examined some of the main aspects of German capitalism. The greatest difference, however, came in inter-firm and intra-firm relationships. Whereas in the US the new, large, integrated managerial firms competed aggressively for market share and profits, in Germany many of them preferred to cooperate' (p. 395). Famous German large enterprises are particularly noticeable in the chemical, electrical and mechanical industries, which directly compete with the American giants. Also, a more recent study by Schwalbach (1990) has concluded: 'technological factors, like scale economies, limit the prosperity of small business. In addition, industries with a high intensity of investments in advertising and R&D, and large domestic and foreign output volumes are dominated by big business'. The quantitative model in the final section will support these remarks.

The Italian case is very similar to the Japanese one in terms of firms' networks and subcontracting. Best (1990) describes it as follows: 'An industrial district is like a collective entrepreneur. In Brusco's terms it combines productive decentralization and social integration . . . We can identify a large number of cooperative institutions within the third Italy that serve as functional equivalents to managerial hierarchy . . . They are establishing an alternative to the Japanese institutional complex as a form of the new Competition' (p. 207). The Italian decentralized and flexible production system has been extensively analysed by others researchers as well.⁸ The Italian industrial districts are characterized by flexible specialization (which is very different from the Fordist organization), competition and cooperation (Pyke et al., 1990). It should also be added that in Italy, as in Japan, the coexistence between very large firms and a myriad of smaller companies creates a positive and unique lever for economic growth.

In the remainder of this section an explanation of the evolution of the Japanese and American firm is conducted by using the tool of linear programming (LP). The following theoretical example of LP will serve to illustrate some of the main issues discussed previously.

Suppose that we have two firms, one in the USA and one in Japan, facing the usual simple LP problem of maximizing profits subject to some constraints. Without disclosing, as yet, which LP problem belongs to which country, the two models are formulated first:

LP1: $\max Z = a x + b y + c z + d w$

Subject to: $a_{11} x + a_{12} y + a_{13} z + a_{14} w \leq M_1$
 $a_{21} x + a_{22} y + a_{23} z + a_{24} w \leq M_2$
 $a_{31} x + a_{32} y + a_{33} z + a_{34} w \leq M_3$

$a_{41} x + a_{42} y + a_{43} z + a_{44} w \leq M_4$
 $a_{51} x + a_{52} y + a_{53} z + a_{54} w \leq M_5$
 $a_{61} x + a_{62} y + a_{63} z + a_{64} w \leq M_6$

LP2: $\max Z = a x + b y + c z + d w$

Subject to: $a_{11} x + a_{12} y + a_{13} z + a_{14} w \leq M_1$
 $a_{21} x + a_{22} y + a_{23} z + a_{24} w \leq M_2$

Z is the objective function to be maximized, x, y, z , and w are the four products to be produced, a, b, c , and d are the profit per unit for each product, a_{ij} are the substitution coefficients, and M_i to M_6 are the technological, human and organizational constraints, such as machines, tools, skilled labour and so on.

Furthermore, the firm in LP1 has the intention to produce four products by using six different types of technological, human and organizational inputs or constraints, as all these inputs are readily available. On the other hand, the firm in LP2 also has the intention to produce the same four products, but its resources are limited to only two types of inputs (namely M_1 and M_2).

According to the rules of the LP formulation the firm in LP1 has two possibilities, either to produce the four products considered x, y, z and w , or to increase its production to six products, say, through vertical integration. On the contrary, the firm in LP2 has only one limited possibility, that is to produce only two products amongst the four (the precise combination will be suggested by the solution of the LP2 problem).

By now it has become apparent that the firm in LP1 is an American firm with its larger choice of inputs, whereas the firm in LP2 must be somewhere in Japan. It would be possible to extend this LP formulation in order to include differences in demand and networking. Also the programming does not have to be linear in order to demonstrate the relevant issues, but it makes its explanation easier.

As an important confirming conclusion drawn from this LP exercise, the Japanese evolution of the firm has been indeed influenced by limited resources (technological, human and organizational) from the beginning of its industrial development a century ago and consequently, it still depends on a myriad of smaller firms for strong economic growth. On the contrary, the American firm has evolved from the beginning of its industrial take-off as a big business and relies much less on the peripheral smaller firms, because resources have always been relatively abundant in the USA.

5.5 QUANTITATIVE EVIDENCE OF THE RELATIONSHIP BETWEEN THE NUMBER OF FIRMS (AS A PROXY FOR COMPETITION) AND ECONOMIC GROWTH

Based upon the previous three sections the following simple but robust cross-country linear regression model is used in order to give some quantitative evidence to the arguments advanced. The 14 European Union countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, and UK, thus excluding Luxembourg), Norway, plus Japan, the USA, Australia, Canada and Switzerland are included in the sample of the 20 most-developed nations. Smaller countries like New Zealand, and Iceland were excluded.

$$RG = \text{CONSTANT} + a * Y60 + b * (TOEST/POP) * EMP99 \\ + c * PAT + d * EXDIV + e * HUCAP + f * INCTAX \quad (5.1) \\ + g * AGRSEC + \text{error}$$

RG stands for average annual growth rate of GDP per worker from 1960 to 1990 as a percentage, and is explained by the following factors (see Appendix 5.2 for actual data). *Y60* stands for GDP per worker relative to the USA in 1960 (the original data are divided by 1000), and represents the convergence variable mentioned in the previous section. The lower this variable is, the higher the *RG* becomes.

TOEST indicates the total number of establishments (all sectors) in 1990, and represents the competition influence, as well as the organizational structure of industries (for instance, the small focal firms of Japan and the larger more diversified firms of the USA). *TOEST* is further emphasized by the contribution of the small business sector as represented by the variable *EMP99*, which indicates the percentage of employment of up to 99 employees in that sector. *TOEST* is multiplied by *EMP99* so that both of them together further stress the contribution of small business to overall competition. *POP* stands for the population in 1990 and is used to standardize the *TOEST* as a per capita variable. The regression variable $(TOEST/POP) * EMP99$ is divided by 1000. The higher this variable is, the higher the *RG* becomes.

PAT is the average annual number of patents granted to residents per 100 000 inhabitants during 1987 to 1990, and it is a proxy for the technological innovations taking place in each country. Thus, we can see from Appendix 5.2 that Japan is the champion in this respect followed further down the ladder by Germany and the USA. The higher this variable is, the higher the *RG* becomes. *EXPDIV* is the percentage of export market value

dominated by the top three destination countries in 1988, and is a proxy for the close integration of each country within a particular region; for example, Canada is trading heavily with the USA. The higher this variable is the higher the *RG* becomes.

HUCAP represents the human capital factor and is approximated by the multiplicative effect of two variables, the *HIGEDUC* and the *SECEDUC*. The *HIGEDUC* is the percentage of the relevant age group receiving full-time secondary education in 1988 and the *SECEDUC* is the fraction of the 20–24 year-old population enrolled in higher education also in 1988. These two variables are put together as $HIGEDUC * SECEDUC$ (*SECEDUC* is raised to the power 3 to emphasize the differences in secondary education, though this does not significantly alter the results). Thus we see that the UK is lagging behind most of the other countries in this respect. The higher this variable is, the higher the *RG* becomes.

INCTAX is the personal income tax (on profits, income and capital gains) as a percentage of GDP in 1989, and is a proxy for government intervention in national economies. Thus, as indicated in Appendix 5.2, Denmark is the champion in this respect followed by Sweden and so on. The higher this variable is the lower the *RG* becomes. Finally, *AGRSEC* is the percentage of total employment in the primary sector in 1991. Thus, Greece still employs a quarter of its workforce in agriculture, followed by Portugal, Ireland and Spain. The higher this variable is, the lower the *RG* becomes.

The ordinary least squares (OLS) regression on equation 5.1 above gave the following very encouraging results:

$$RG = 4.3 - 42.2 * Y60 + 0.19 * (TOEST/POP) * EMP99 \\ (0\%) \quad (0\%) \quad (0.3\%) \\ + 0.012 * PAT + 0.009 * EXDIV + 0.01 * HUCAP \\ (2.0\%) \quad (13.4\%) \quad (4.5\%) \\ - 0.03 * INCTAX - 0.03 * AGRSEC \quad (5.2) \\ -(1.6\%) \quad (9.1\%) \\ R^2 = 0.975; \quad SEE = 0.21.$$

The figures in brackets under the coefficients denote P-values (a P-value of 5 per cent means that the coefficient is significant at the 95 per cent confidence level). Only the variables *EXDIV* and *AGRSEC* are not significantly different from zero at the 5 per cent level (13.4 per cent and 9.1 per cent respectively). Furthermore, all coefficients have the expected (right) signs. There is no apparent concern for multi-collinearity.

The interpretation of these results can also be seen if we calculate each variable's contribution to the *RG*. Thus, regarding the variable *Y60*, if

a country such as Japan started in 1960 with a low GDP per worker of 20 per cent as against 100 per cent for the USA, then the average constant RG of 4.3 (the constant of the regression) is only reduced by 0.84 for Japan and by 4.22 for the USA during the period 1960 to 1990. Regarding the contribution of the variable representing competition, that is $(TOEST/POP) * EMP99$, a country like Japan with a high value of this variable will benefit by an extra 0.81 of one per cent of growth, as against 0.26 of one per cent for the USA.

Regarding the variable PAT (patents), the proxy for technological innovations, the extra growth for Japan is 0.52 as against 0.23 for the USA. The human capital variable $HUCAP$ contributes to the growth of Japan by an extra 0.26 and to that of the USA by an extra 0.56 of one per cent growth. Note that all these contributions to annual growth, not only for Japan and the USA but also for every other country in the sample, are comparative contributions, that is they are due to comparing each nation against the others. However, within each country's economic growth the constant 4.3 per cent indicates the growth generated by each country's common technological and organizational advancements, investments and so on (common to all nations).

Finally, a brief examination of the residuals (see Appendix 5.2) shows that overall the errors are very small and most probably due to errors in the data.

What are the main conclusions of this quantitative analysis? First, in relation to the topic of this study, the econometric model shows that competition and SMEs play a clear and decisive role in economic growth. This model shows that even when we take into account some of the fundamental factors in determining economic growth such as unsatisfied demand, technological innovations and human capital, then competition and the number of SMEs still have an important role to play. At the same time, as the number of SMEs is also a proxy for the organizational structure of firms, the regressions confirm the contention that historical differences in company organization (for example small focal firms in Japan as against larger diversified firms in the USA) make significant differences in contributions to economic growth.

Second, the convergence factor or unsatisfied demand seems to play a preponderant role in determining economic growth, thus reaffirming similar conclusions from the relevant literature (see for example Barro and Sala-i-Martin, 1995, or Jones, 1998 for a comprehensive review).

Third, if the estimated constant of regression (5.2) is further examined, an interesting concept emerges. If all the seven explanatory variables are negligible, then the average growth rate is about 4.3 per cent per annum. If the convergence factor is expressed as 50 per cent of the GDP per capita level of the

USA in 1960, and all other factors are virtually zero, then the average growth rate is about 2.2 per cent per annum. It is proposed to call these various levels of growth rates thus determined the 'intrinsic' or 'auto-sustained' rates of growth. For example, if the convergence factor is expressed as about 100 per cent of the GDP per capita level of the USA in 1960, and all other variables of regression (5.2) are virtually zero, then the 'intrinsic' rate of growth is about 0 per cent per annum. This also means that unless the other variables such as competitive forces, technological cum organizational innovations and human capital increase, economic growth per capita will tend to go to zero. Consequently as these variables in developed countries tend to be positive and significant, economic growth per capita will not tend to go to zero, thus supporting the endogenous type of economic growth.

Fourth, it is worthwhile detecting the reasons for a positive growth rate in the USA in the last 30 to 40 years. Since the initial conditions of economic development were 100 per cent for that country in 1960 (the value of $Y60$), the average growth rate would have been zero if the other variables of the model were not positive. Thus the American economy grew at an average of 1.4 per cent from 1960 to 1990, because of improvements in human capital (about 0.56 per cent), because of the competitive factor (about 0.26 per cent), and because of technological advancements (0.23 per cent) (the remaining variables cancelling out).

In conclusion for this section, it must be emphasized that despite the small sample of data used in this cross-section analysis, the results cannot be ignored. More research is of course needed in order to confirm the empirical findings.

5.6 IMPLICATIONS FOR THE ECONOMIES OF EAST ASIA AND THE USA

The comparison between the two major economies in the world in terms of competitive strength, organizational characteristics and economic growth presented in this study entails some important policy implications for the economies of the USA and East Asia. For the USA and other Western countries evidence suggests that there is a strong tendency for vertical disintegration (Krajewski and Ritzman, 1999, p. 99; or Grant, 1998, p. 196 or 326); this means that the role played by smaller companies for outsourcing purposes becomes more important and that big firms become smaller. For the USA, this disintegration process and the parallel adoption of the JIT/QC system was translated into higher industrial growth rates in the 1990s (Samidas, 2001). Overall, it seems that American firms are becoming more focused like the Japanese firms have been in the last hundred years or

so, and hence they have lately been experiencing higher growth rates than before. Thus, it is evident that the recent American experience fully supports the findings of this study, namely that organizational innovation, coupled with stronger competition, leads to higher economic growth rates.

For Japan, the situation has been diametrically opposite to that of the USA in the last ten years; Japan has not yet recovered from the recession of 1990-91. Many profound changes are in the process of taking place in this country (see for instance Mroczkowski and Hanaoka, 1998; Ito, 1996; Turner, 1994; Lincoln et al., 1998; Kono and Clegg, 2001). Overall, it seems that both larger firms and SMEs are going through some important transformations; however the direction of the latter is not clear yet: are the *keiretsus* disintegrating or becoming less lean? Or are the SMEs becoming larger and diminishing in total number? From the above-cited references the conclusions are not as yet clear; certainly the SMEs are still very strong in Japan despite a multitude of problems. Whittaker (1997, p. 214) summarizes his conclusions in this laconic sentence: 'A transformation is undoubtedly taking place within Japan's small firm sector.' According to the findings of this study, it would be a mistake to suggest policies that do not encourage the strengthening of SMEs; Japanese policy makers know that very well (Whittaker, 1997).

For the other East Asian economies, the strengthening of competition through the support of SMEs seems to be the best policy at the micro level. For instance, in Korea the eventual weakening of the economic oligarchy (the 30 or so families that control most of the economy), coupled with the encouragement of new small independent firms, would reinforce the Korean economy in the long run. In China, the transition from state-owned firms to private firms would be detrimental to the economy if it took place by encouraging the establishment of larger firms only. Overall, East Asian economies with very large populations would be better off if competition were primarily based on the SMEs of these countries, and there is clear evidence throughout the region of the need to place greater emphasis on their further development.

5.7 SUMMARY AND CONCLUSIONS

This study has examined and contrasted two Chandlerian analyses of firm evolution and subsequent growth, namely one suggested by Chandler's monumental work, and the other by Fruin's less voluminous but enlightening work. This study has attempted to add some more light as to why the two largest economies of the world, the USA and Japan, differ in terms of their organizational structures and economic growth. This attempt

consisted of comparing Chandler's and Fruin's analyses both qualitatively and quantitatively, and in the context of other scholars' work. The following partial conclusions can only be part of the more general historical context in which societies and economies evolve.

The first two sections provided some qualitative evidence about three fundamental differences between the American and the Japanese firm evolutions (the discussion on these differences took place in the third section). First, from the beginning, Americans opted for the 'big business' organization and continued to do so during the twentieth century, contrary to the Japanese entrepreneurs who opted for the smaller or focal firms. Second, American companies have very often been industrially organized as monopolies or oligopolies, and with a tendency for a centralized type of management or one that is multidivisional; whereas the Japanese firms have been a mixture of a handful of conglomerates plus an army of SMEs, and a tendency for a decentralized type of management or one more functional than multidivisional. Third, the Americans have opted for production of diversified related products, whereas the Japanese opted for a small range of products, that is for specialization and subcontracting. Explanations as to why Japanese firms evolved differently from American ones included differences in natural resources and technology, which were examined under the light of (linear) programming models. Other explanations (see section 5.2) were a consequence of historical circumstances.

The third section related the two firm evolutions to economic growth and competition. Two main conclusions are worth mentioning here. First, the particular firm evolution in Japan and its consequential organizational features has led to, until recently, very high economic growth, substantially higher than that of the American economy. The econometric cross-country model of the fourth section has carefully shown that countries such as Japan and Italy have experienced higher growth rates than the USA and Germany because of stronger competition elements and more effectively organized firms, as these factors are approximated by the number of SMEs in each country (other reasons for higher economic growth were also included in the analysis). Second, inter-firm economies of scope and non-integration were a major moving force behind Japan's higher economic performance, contrary to the intra-firm economies of scale and scope and vertical integration of American firms. In the opinion of the author these inter-firm economies of scope constitute the major Japanese organizational innovation leading to higher economic growth rates. It is worth repeating Fruin's (1992, p. 157) conclusion again:

a strategy of maximizing inter-firm economies of scope through group-driven cooperative transactions made better sense than the pursuit of internal

production and allocative efficiencies through vertical integration and product diversification . . .

From the fourth section, the econometric analysis shows that a higher economic growth rate for countries such as Japan and Italy comes from the following four main factors. First, from the convergence factor or unsatisfied demand, thus confirming the relevant literature on the matter. Second, it comes from technological innovations. Third, it emanates from the degree of competition and organizational effectiveness as approximated by the number of SMEs. And fourth, it derives from the human capital factor. An interesting corollary of this conclusion is that for the 20 most-developed countries in the sample, if the convergence factor is expressed as 100 per cent of the GDP per capita level of the USA in 1960, and all other factors are virtually zero, then the average growth rate is about 0 per cent per annum. Consequently, as these variables in developed countries tend to be positive and significant, economic growth per capita will not tend to go to zero, thus supporting the endogenous type of economic growth.

APPENDIX 5.1

Table 5.1 Data for establishments

Country	Establishments* (m. (000))					POP**					Establishments per 100 000 inhabitants				
	1980	1982	1984	1986	1988	1980	1982	1984	1986	1988	1980	1982	1984	1986	1988
Australia	4.3	2.4	0.9	0.0	0.1	15.2	15.2	9.2	5.9	0.2	8.5	5.6	10.4	4.8	10.4
Austria	0.8	0.7	0.5	0.0	0.1	7.6	7.6	4.9	2.4	0.2	8.5	5.6	10.4	4.8	10.4
Canada	3.7	4.3	1.3	0.6	1.4	25.2	14.7	17.1	5.2	0.6	1.4	0.9	4.8	8.0	8.0
Denmark	0.9	1.0	0.3	0.1	0.3	5.1	17.6	19.6	5.9	2.4	3.0	3.0	8.0	8.0	8.0
Finland	0.7	0.7	0.2	0.1	0.3	4.9	14.3	13.3	4.1	1.2	6.1	3.1	7.0	7.0	7.0
Germany***	5.3	5.3	3.3	1.2	1.5	61.0	8.7	9.0	5.4	2.0	1.6	2.5	4.9	4.9	4.9
Greece	0.6	0.4	0.3	0.0	0.3	9.9	6.1	4.0	3.0	0.4	2.5	0.7	2.8	2.8	2.8
Ireland	0.6	0.3	0.3	0.1	0.1	3.5	17.1	17.1	8.6	7.1	3.4	2.2	7.0	7.0	7.0
Japan	50.7	46.5	34.0	14.7	10.6	120.8	42.0	38.5	28.1	13.2	12.2	8.8	13.8	13.8	13.8
Norway	0.8	0.6	0.3	0.1	0.1	4.2	19.0	14.3	6.2	2.3	11.2	2.1	9.2	9.2	9.2
Portugal	1.2	1.1	0.2	0.2	0.1	12.1	11.1	11.1	1.7	0.4	2.3	1.4	4.8	4.8	4.8
Spain	14.7	13.7	2.2	0.4	1.2	38.4	38.3	38.3	5.7	0.9	3.1	0.2	14.0	14.0	14.0

APPENDIX 5.2

Table 5.2 Original data used in the regression

	R ²	Error	Y60	TOEST in 1000	POP millions	TOEST /POP	EMP99 %	PAT EXPDI	SECT. DUC	HIG. DUC	HUCAP %	INC. TAX	AGR. SEC
Australia	1.5	0.06	78	450	17	25.3	59	6.4	38	0.99	29	14.3	5.5
Austria	3	-0	44	180	7.7	23.4	50	17.3	53.5	0.8	31	15.9	7.9
Belgium	2.7	0.01	58	490	10	49.0	55	4.9	54.4	0.99	13	16.4	2.8
Canada	1.9	-0.2	29	600	26.6	22.6	64	4.4	82.2	1.05	62	16.7	4.5
Denmark	1.8	0.2	60	170	3.1	13.3	64	5.9	38.8	1.07	17	18.0	5.5
Finland	2.9	0.05	47	110	5	22.0	61	15.9	41.5	1.08	40	19.2	8.5
France	2.7	-0.1	55	1980	56.7	14.9	54	15.3	38.4	0.94	33	29.1	6.1
Germany	2.5	-0.2	57	2290	62	36.9	46	28.1	31	0.94	22	26.6	3.3
Greece	4.1	-0.3	21	690	10.1	68.3	81	4.8	47.8	0.95	28	24.0	25.3
Ireland	3.5	0.26	14	170	4.5	37.1	56	0.7	55.5	0.98	25	23.5	1.5
Italy	3.4	0.15	45	3920	56.7	69.1	73	0.3	43.3	0.76	26	11.4	8.5
Japan	5	0.15	29	7000	123.5	56.7	73	43.2	45.9	0.95	30	25.7	6.7
Netherlands	2	-0	70	420	15	28.0	54	3.4	49.1	1.04	42	16.0	4.5
Norway	2.4	0.07	58	90	4.2	21.4	59	6.7	50.1	0.94	35	29.1	5.9
Portugal	4.1	0.16	29	600	9.8	61.2	65	0.2	45.2	0.59	18	3.7	17.8
Spain	1.9	0	24	2400	39	63.1	70	4.4	40.3	1.05	32	37.0	10.7

Source: Danny (1995).

ISIC codes: 3810 metal products
3820 machinery nec
3830 electrical machinery
3832 radio, television, telephones, records, etc
3840 transportation equipment
3843 motor vehicles

**For Germany, and for 3832, and 3843 the figures were guessed

**POP stands for population in millions

* For the year 1986, or if not available for the year 1987

These numbers should be treated with caution, as they are not consistent in definitions and accuracy

Notes

ISIC number	3810	3820	3830	3832	3840	3843	POP**	Establishments per 100,000 inhabitants
Sweden	1.6	1.2	0.4	0.1	0.5	0.3	8.4	19.0
Switzerland	1.1	0.0	0.0	0.1	0.0	0.0	6.5	16.9
UK	14.6	22.5	9.8	3.7	4.4	2.1	56.7	25.7
USA	35.9	53.1	16.6	8.5	11.6	6.6	238.5	15.1
average	3843	3810	3820	3832	3840	3843	3810	3820

Table 5.1 (continued)

NOTES

1. One of the latest books on this issue is Acs et al. (1999).
2. See for instance Storey (1994).
3. See for example Mulhern (1995).
4. See for example, Carree and Thurik (1998), Nickel (1996) and Pratten (1991).
5. For recent work on small firms in this country see Whitaker (1997).
6. Firm organization according to divisions, and not according to functions as in the L-form.
7. On the importance of this system see Sanidas (2001).
8. For a good review see Pyke et al. (1999).

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Table 5.2 (continued)

AGR	INC	HIC	HIC AP	INC AP	%	%	AGR	INC	HIC	HIC AP	INC AP	%	%
1.2	23.3	22.6	21	19.8	63	22.9	33.2	0.9	31	22.6	21	19.8	63
5.8	12.7	25.0	35	40.4	67	48.9	38.9	1	35	25.0	35	40.4	67
2.2	14.3	13.2	23	34.9	49	7.7	39.9	0.83	23	13.2	14.3	13.2	23
2.9	13	56.5	60	39.9	56	19.1	39.9	0.98	60	56.5	13	56.5	60
1.4	0.36	100	100	249.9	249.9	24.0	56	19.1	100	100	1.4	0.36	100
USA	2	26.30	60	56.6	46.5	24.0	56	19.1	60	26.30	2	26.30	60
UK	1.6	150	82	6.7	22.4	24.0	56	19.1	82	150	1.6	150	82
Sweden	1.6	170	71	8.6	19.8	24.0	56	19.1	71	170	1.6	170	71
Switzerland	1.4	100	100	249.9	249.9	24.0	56	19.1	100	100	1.4	100	100
USA	2	26.30	60	56.6	46.5	24.0	56	19.1	60	26.30	2	26.30	60

Note: For the definition of variables see text, section 5.2.

Sources:

The variables *RG* and *Y60* were extracted from Table B.2 in C.J. Jones (1998).

The variables *PAT*, *EXPDI*, *SECEDEC*, *HIGDEC*, *INCTAF* and *AGRSER* are extracted from Tables 7.25, 7.27, 8.11, 8.12, 8.29 and 8.30 respectively in IMD (1992). Note that for Switzerland, *SECEDEC* was guessed to be 1, *HIGDEC* is a derived variable (see section 5.2).

For the variable *POP* was taken from the OECD publication (1995).

For the variables *TOEST* and *EMPE9*, various sources were used and some rather 'harmless' estimations were performed because the data in this domain are not very reliable nor consistent. As the authors of the 1997 OECD report on SMEs remarked, 'The demand for reliable, relevant and internationally comparable data on SMEs is on the rise' (p. 3).

For the 11 EC countries of 1990, the Table 2.8 of the ENSR (1994) report was used without any further calculations. For the three EFTA countries (Austria, Finland, Norway, and Sweden) the corresponding figures were estimated from the information on p. 32, same report (ENSR). For the countries Switzerland, Norway, and Canada the figures were estimated by using the sources of the OECD report (1997) on SMEs, Tables 1.1 to 1.6, the manufacturing relevant data from Darnay (1995), and the OECD (1996) report. For Japan, Table 14.2, volume 4, of Statistics Bureau, Management and Coordination Agency, 'Historical Statistics of Japan' (1987), was used and the figures were extrapolated for 1990. For the USA, Table 873 of the 1991 National Data Book was utilized, and the figures were extrapolated for 1990. For Australia, various issues of the 'Yearbook Australia' were utilized and the appropriate figures were estimated. Note that in the model presented in section 5.5 above, the estimated figures did not affect the significance of the results, mainly because the data for the main countries such as Japan, the USA and Italy are relatively accurate. Also, small changes in these estimated figures do not alter the regression results significantly.

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