

The Evolution Of Firm Size and Employment Share Distribution in Japanese and UK Manufacturing: A Study of Small Business Presence

Noriyuki Doi
Marc Cowling

ABSTRACT. This paper traces the changing contribution of small firms to manufacturing in Japan and the UK between 1972 and 1992. It shows that there are significant and important differences between the two countries, although in both cases small firms provided an increasing share of the total stock of firms over the period. In the UK however small firms also increased their employment share, primarily at the expense of large firms whilst in Japan their share remained constant. One of the most striking differences is the fact that in the UK only the very smallest micro businesses achieved a net increase in numbers, whereas in Japan all sizes of firm recorded an increase in numbers, albeit at declining rates by firm size.

I. Introduction

This paper shows that small firms have become relatively more important in both the UK and Japan, but we offer very different reasons for these developments. In the UK the relative growth in small firms is because of the poor competitiveness of large firms. Such firms are experiencing contracting demand. For these reasons they shed jobs and seek to become more competitive through outsourcing. In addition, their vacation of markets

does leave niches which can be exploited by smaller firms, even if much of these markets are met by overseas firms, it still leads to new firms in the economy.

The reverse is the case in Japan. Here large firms are internationally competitive; this is reflected in the increased demand for their goods and services. This competitiveness is at least partly based on the excellence of their suppliers, so increased demand is 'fed through' to suppliers. The extent to which suppliers grew relatively faster than the OEMs (original equipment manufacturers) depends on the presence of managerial scale/scope economies.

To set such developments in a historical context, few would argue that the 1970s and 1980s saw the dramatic development of the Japanese economy led by the emergence of industrial giants, able to exploit their technological competitiveness. This technological/competitive edge has been attributed to the availability of excellent parts, components and peripherals combined with an ability to develop new technologies (1). However, small and medium sized enterprises (SMEs) have also been important by providing intermediate goods, via vertical transactions in the general machinery, electrical equipment, transportation equipment and precision instruments sectors.

The key differences between the UK and Japan is that, in the former, there has been a decline overall. This is reflected in the UK's share of the volume of world trade in manufacturers, which fell from 9% in 1970 to just 5% by 1992.

As a direct result of the success of Japanese large firms and the relative failure of their UK counterparts SMEs are increasingly becoming an

Final version accepted on September 19, 1996

Noriyuki Doi
Kwansei Gakuin University
Nishinomiya, 662
Japan

and

Marc Cowling
Centre for Small and Medium Sized Enterprises
Warwick Business School
Coventry CV4 7AL
England

important focus for research and government policy. To quote from ACOST (1990), 'SMEs have a crucial role to play in bringing about a dynamic and competitive economy. They have a significant role in innovation and are a major source of new competition and new employment opportunities'. That is to say that competitive and entrepreneurial SMEs are an important mechanism for the smooth transition of industrial structure and concomitant economic development. However, to suggest that the study of small firms is a recent phenomenon would be to ignore the important contributions made by Marshall (1920) who stated that 'small businesses are on the whole the best educators of the initiative and versatility which are the chief sources of industrial progress' (p. 249), and Schumpeter (1934) who saw the role of small firms as that of creative destructors via their ability to bring totally new products to the market.

This paper examines the evolution of firm size and employment share distribution in Japanese and UK manufacturing between 1972 and 1991. The comparison itself is an interesting one as both countries have very high shares of SMEs, yet there are significant differences between the two countries in the way manufacturing has evolved over these two decades in Japan and the UK.

To begin the paper proper we will seek to establish a link between the organisation of the firm as a theoretical construct and what empirical evidence shows us is happening in developed economies at present and in the recent past. In doing so we will identify three basic propositions which can be tested against the data. One of the most fundamental questions concerning the organisation of production is whether firms should adopt a strategy of internalising production or purchase the necessary components externally. Evidence from Doi (1991) indicates that in sectors dominated by large firms, the greater the share of output contracted out to SMEs, the stronger the international competitiveness of the firms and industries, measured by the export/sales ratio. Yet Turik (1996) argues that, amongst other things, an increased share of small firms, without the sub-contracting effects identified by Doi, may lead to a lower orientation towards exports.

Odagiri (1992, p. 137) notes that Japanese firms tend to be less vertically integrated than US firms, a feature which is likely to hold true for Japan

compared to the UK. This leads us into the heart of the Japanese structure of industrial organisation, that of firm-supplier relationships. It is often noted that such relationships tend to be extremely close and as a consequence firms become locked in to longer-term alliances. Such an alliance is termed a *keiretsu* in which the end producer exerts a degree of control over the keiretsu. These assembler-supplier keiretsu are fundamental to the just-in-time production methods which are playing an increasingly important role in manufacturing industry. This leads to the following proposition:

Proposition 1: The share of employment and output across firm size groups in Japan will exhibit relative constancy due to the assembler-supplier system.

This is because the nature of the the keiretsu system in Japan implies that growth in demand for the output of large firms will lead to a broadly equiproportional increase in demand for the output of small firms.

Proposition 2: The share of smaller firms in terms of total employment and stock of firms in the UK will be increasing over time.

The decline in the international competitiveness of large UK manufacturing firms and their vacation of markets leaves niches which can be successfully exploited by small firms. As such we might expect that there will be a dual substitution effect apparent in which the importance of large firms is declining in both absolute and relative terms. In the first instance, large UK firms output is now being met by more competitive foreign firms, and secondly, the fragmentation and specialisation of domestic markets means that economies of scale are unobtainable. Thus the creation of niche markets where scale economies have little relevance provide a fertile breeding for specialised small firms to operate within. If we combine this effect with an increasing demand for heterogeneous products then it is perfectly rational to expect to observe an increase in the population of small firms.

Proposition 3: The average firm size in total and within size groups will be declining in both Japan and the UK.

This proposition can be tied in with the growth in market fragmentation and the nature of changes in technology, both features identified by Carlsson (1992) as important, underlying changes which became apparent since the 1970s. At the same time there is considerably evidence of growth in the outsourcing of production. Linked in with such issues are the extent to which new technologies can generate productivity gains in all firms, but at the same time the requirement for more flexible production techniques is consistent with a shift in economic activity towards smaller manufacturing units.

The rest of the paper is set out as follows: Section II outlines some of the most common definitions used to identify SMEs, Section III provides evidence relating to the evolution of firm size and employment distribution in Japan and the UK with particular emphasis placed on the aggregate share of SMEs, measured in terms of number of firms, employment and value of shipments. We conclude in Section IV with some suggestions for further research.

II. Defining the SME

The Bolton Committee (1971) in the UK defined a small business in manufacturing as one having up to 200 employees. This emerged from the Committees conceptual view of a small business in terms of the competitive nature of the markets in which it operated and the control exercised by the owner and his or her involvement in the day to day running of the business. Other definitions emphasise the particular problems and difficulties that small firms face due to their 'smallness'. However, such terms are very ambiguous and leave themselves very much open to alternative interpretation, as is the case in Japan where SMEs are often characterised as 'smaller and fragile firms'.

Since our purpose is to capture statistically the presence of SMEs in both Japan and the UK, and their contribution to employment, we utilise the official definitions to compare the two countries. Japanese SMEs in manufacturing are officially defined as firms with less than 300 employees; those with less than 20 and 5 employees are respectively called small firms and micro firms. On the other hand, in the UK SMEs are usually

defined as firms with less than 500 employees. The definition was adopted in the EC as well. In the UK and EC, firms with less than 200 and 10 employees are respectively called small and micro firms. These definitions are summarised in Table I.

TABLE I
Employment based definitions of SMEs

	Japan	UK	EC
SME	<300	<500	<500
Small	<20	<200	<200
Micro	<5	<10	<10

SMEs may also be defined according to financial criteria. In Japan SMEs are defined as firms with less than 100 million Yen of equity capital (£667,000). The UK definitions based on turnover and total assets tend to reflect the definitional specifications of the Inland Revenue regarding not only reduced auditing requirements for smaller firms but also for more favourable tax evaluation.

TABLE II
Alternative definitions of SMEs

Criteria	Small firm	Medium firm
Japan		
Equity (Yen)	<100 million	>100 million
UK		
Turnover (£m)	<2.0	<8.0
Total Assets (m)	<0.975	<3.9

Table III shows the distribution of the number of firms by employment size 1991. Here a firm is defined as an establishment. However, it is important to note that in Japan there is an absolute correlation between establishments and firms in the small firm categories and a high correlation in the population as a whole. The source is for the bulk of this paper is the Census of Manufacture by Firm and Industry, although the Establishment Census is used where indicated, and for the UK the Business Monitor PA 1003. What is apparent is that the distributions are very similar, despite the fact that Japan had over 195,000 more manufacturing firms. The most striking feature is that small (and medium-sized) firms dominate in both countries when expressed in this way. However,

TABLE III
Manufacturing employment size distribution, 1991*

Employment size	<100	100–199	200–299	300+	Total	Number
Japan (%)	95.5	< 3.3	>	1.2	100.0	337,578
UK (%)	93.9	3.1	< 3.0	>	100.0	142,501

Sources: Establishment Census of Japan and UK Business Monitor PA1003.

* The UK data refers only to VAT registered firms.

given our focus is on the employment effects of small firms, or the evolution of employment share by firms size, this is not a particularly useful way of expressing the evolution of small manufacturing firms over time. Despite this caveat, it is interesting to observe the apparent similarities between the UK and Japan on this measure.

III. SMEs in Japanese and UK manufacturing

(i) Ownership patterns

Four main types of legal entity exist in Japan, namely (i) Joint-stock companies, (ii) limited companies, (iii) partnerships, and (iv) private proprietors. The distribution is shown in Table IV.

Perhaps the most easily identifiable feature is that around 75% of Japanese SMEs are privately owned, with the greatest share being sole proprietorships. For large Japanese firms the reverse is true with virtually all firms being publicly traded. There is also a significant dearth of partnerships.

In the UK the legal structure is very similar to that in Japan. The UK pattern is shown above and it is immediately apparent that more UK firms have limited liability than is the case in Japan. Secondly partnerships are an important phenomenon (over 1 in 5 firms) in the UK. The relative popularity of partnerships in the UK can, in part, be attributed to the fact that they are under no legal obligation to publish financial statements and fur-

thermore, that taxes are computed separately for each partner after deducting for allowances and other entitlements. One interesting feature is that over the 1980s this legal distribution does not appear to have changed significantly (Daly and McCann, 1992).

(ii) Firm size structure

SMEs in Japan have substantially increased in numbers since 1966 (see Figure 1). This trend is consistent with other countries' experiences. In a similar vein, their numbers were reduced in the subsequent recession in 1992, which many in Japan either had not experienced before or were apparently unprepared for. Yet it is the relative change in the number of firms by firm size (in terms of employment size) which are of most interest at this stage at both an intra-country level and between the UK and Japan. Figure 2 shows the trends in firm size distribution and its evolution over the period 1972–1991. For Japan, we can conclude that the growth of the number of firms is “dramatic” in micro and small firms, “steady” in SMEs (excluding micro and small firms), and “low” in large firms. In the UK, growth in terms of numbers of micro firms was particularly high between 1976 and 1986. More recently though this growth rate has fallen, with the addition of only 3,000 firms between 1986 and 1991 (see Figure 3).

TABLE IV
Legal distribution of Japanese firms, 1991

	Private proprietors	Partnerships	Private Ltd	Public/Joint stock	Total
SMEs (%)	54.6	0.9	20.7	23.8	100
Large firms (%)	0.15	0.05	0.5	99.3	100

Sources: Establishment Census of Japan, 1991.

TABLE V
Legal distribution of UK firms

Sole Proprietors	Partnerships	Private Ltd	Public Ltd	Total
19.3%	22.5%	< 58.2%	>	100%

Source: UK Business Monitor PA 1003

SMEs in Japan

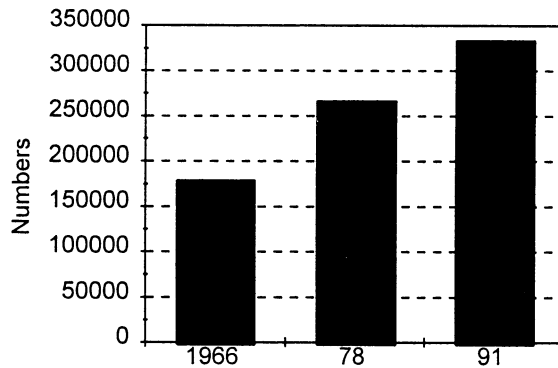


Fig. 1.

Firm Growth Rates by Size Band

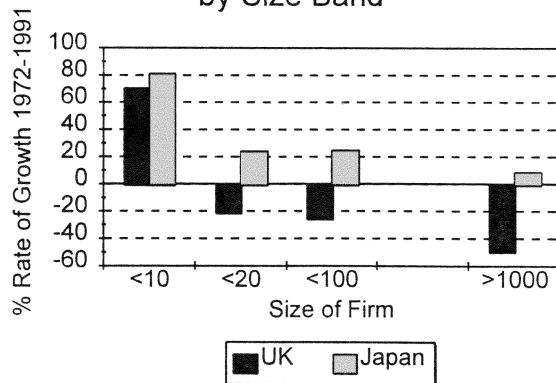


Fig. 2.

However, when taken in isolation, these figures do not reflect the increase in the relative importance of smaller firms in manufacturing. *In the UK between 1976 and 1991, numbers of micro businesses increased by 70% in contrast to all other (larger) size categories which declined at an increasing rate by size of firm. In the largest UK*

Japanese Manufacturing

Employment Share of Firms by Size

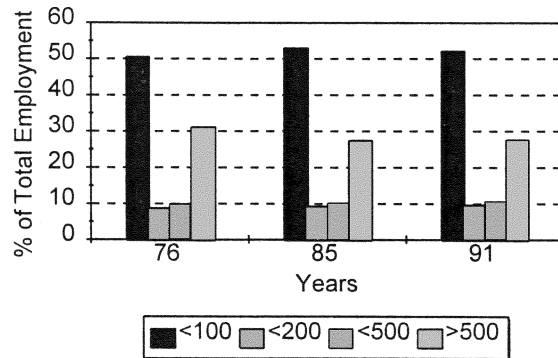


Fig. 3.

firms with in excess of 1000 employees numbers declined by nearly 49% between 1972 and 1991. This contrasts significantly with the 8.5% increase in the numbers of large Japanese firms.

By 1991, the UK had only 1,359 large manufacturing firms whereas in 1972 there were 2,710. By contrast, in 1976 there were 59,000 micro businesses, a figure that had risen to 100,000 by 1991. This might be indicative of a structural shift in the nature of UK manufacturing away from larger firms towards smaller firms. Yet it might also be the case that mergers between larger firms have created fewer but even larger firms. For this reason trends in average firm size are investigated subsequently.

(1) Level and trend in SMEs' share – static analysis

In this part of the paper we move on to examine the level and trend in the overall share of SMEs firstly in Japan and then in the UK. In Japan, two data sources are available for the purpose, the Establishment Census and the Census of Manufactures, published by the Ministry of International Trade and Industry (MITI). The former source does not include the distribution of economic activity by firm size. Therefore, analysis here is based largely on the latter data.

The first examination of size structure is about the size distribution, following the Census of Manufactures by Firm (Hereafter the Census (by

Firm). The shares are measured by value of sales and employment. It is necessary to note that the firm data based on employment size do not include establishments with less than 4 employees.

In general, the aggregate share of SMEs is relatively stable over the period. But, the two measures of share suggest a different trend. SMEs employment share marginally increased from 51% in 1976 to 53% in 1991. On the other hand, sales share is virtually stable around the 30% level. This trend is consistent with the findings about aggregate concentration of big firms in economic activity in that aggregate concentration of the largest 100 or 200 manufacturers tends to be stable or in decline (Doi, 1986, 1991).

Japanese Manufacturing

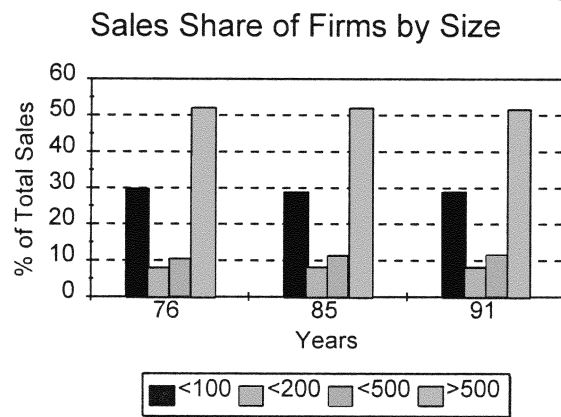


Fig. 4.

Thus, on the evidence presented, we can conclude that SMEs' share in Japan is high and stable over the period 1976 to 1991. This finding appears to contrast with other countries' experiences. In the US, SMEs' aggregate share in manufacturing has increased in the recent decade (Acs and Audretsch, 1990, 1993). The Japanese experience implies that in aggregate Japanese SMEs have grown in parallel to the growth of the national economy and larger manufacturing firms. In fact the great stability in both employment share and sales share suggests that SMEs have contributed equally to the economic development of Japan (3) in spite of considerable macroeconomic fluctuations over the two decades measured.

Such Japanese findings may be related to the fact that there are a great number of subcontractors in Japanese manufacturing. Since many Japanese SMEs are subcontractors, defined as a firm which "produces output to a specification or design which is specialised to individual customer requirements" (4), the stable share of SMEs implies that the growth in demand for the output of larger firms has fed directly through the supply chain to SMEs. In fact, more than half (i.e., 55.9% in 1987. SMA, 1992, p. 85) of Japanese SMEs are subcontractors.

UK Manufacturing

Employment Share of Firms by Size

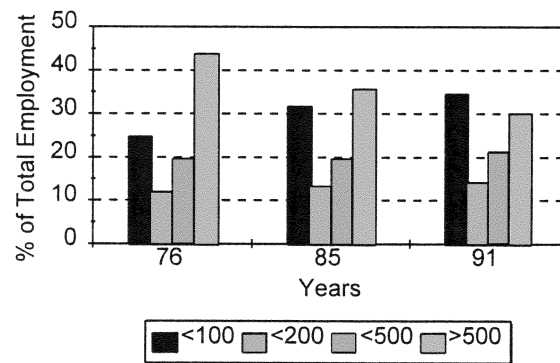


Fig. 5.

The corresponding data for the UK shows that smaller firms (1–99 employees) have increased their relative share of the stock of firms from 89% in 1976 to 94% by 1991. Over the same period medium-sized firms (100–499) have seen their share reduced from 9% to 5%, whilst the share of large firms has fallen from 2.2% to 0.9%. Thus when measured simply by firm numbers, micro businesses dominate UK manufacturing as the large firm base declines.

Measured in terms of the relative employment contribution, the picture is broadly similar, with small firms increasing their share of total employment in UK manufacturing from 25% to 34.5% over the fifteen year period to 1991. The key feature here is that the employment share of large firms fell from 44% to 30%. Thus the evidence indicates that not only are there fewer large UK manufacturing firms, but that their importance to

employment is becoming less and less over time. At the micro business level not only has there been a massive absolute and proportional increase in firm numbers, but they have also come to account for a considerably higher share of total employment in the UK.

For SMEs as a whole, the employment share increased from 56% to 70%, although the vast majority of this occurred in micro-businesses. This is in marked contrast to both Japan and the US, where SMEs share of total employment was 44% and 35% respectively. This, according to Storey and Johnson (1987) is attributable to the poor performance of large firms in the UK rather than any particular dynamism on the part of smaller firms.

Thus whilst in the UK the evolution of manufacturing has been characterised by a dramatic expansion of the micro and small firms base at the expense of large firms, the pattern of development in Japan has been one of complimentary co-evolution with all size classes expanding, albeit at different rates.

(2) Trends in average firm size

Recently, some economists (for example, Acs et al., 1990) suggest that firm size tends to become smaller in the US and Europe. The finding is likely to be related to the fact that SMEs play a large and increasingly important role. Such a tendency has been theoretically emphasised by Blair (1972) and Piore and Sabel (1985). Flexible manufacturing technologies such as the introduction of new materials (for example, plastics) and the increasing use of computers and general purpose machines (for example, NC machine tools) tend to reduce minimum efficient size. In fact, many Japanese SMEs have also introduced flexible manufacturing equipments like NC machine tools, robotics and CAD. The ratio (in December 1991) of SMEs which have introduced those equipments is 61.7% for NC machine tools, 36.7% for MC, 27.8% for CAD, 11.9% for CAM, 4.0% for FMS, 28.9% for general purpose computers, 53.1% for office computers and 21.3% for inter-firm on line equipment (See SMA (1992, p. 110)). Therefore, it is predicted that the Blair-Piore-Sabel hypothesis holds true for Japanese firms.

Now, an attempt will be made to test this rela-

tionship for Japanese and UK firms, for the period 1976–91. The mean size in Japan was computed from the Census (by Firm) and in the UK from the PA1003 series.

Average Micro Firm Size

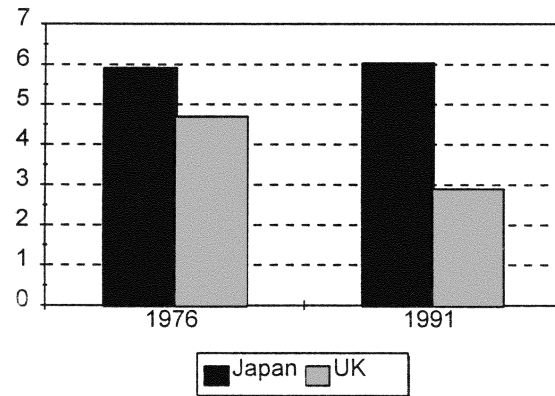


Fig. 6.

Aggregate mean firm size in manufacturing tends to be fairly stable over time around the 24 to 26 employee level in Japan. In the UK however, aggregate mean firm size exactly halved between 1976 and 1991 from 60 to 30 over the period. The mean size is decomposed into:

$$E/N = (E_l/N_l) \cdot l - N_s/N + (E_s/N_s) \cdot N_s/N,$$

with $E_l/N_l > E_s/N_s$

where E is the number of employees, N the number of firms, and subscripts l and s stand for large firms and SMEs respectively. Notations with no subscript show the figures of the whole manufacturing sector. The change in aggregate mean size is determined by the changes in mean sizes of large firms (E_l/N_l) and of SMEs (E_s/N_s) and in firm share of SMEs (N_s/N). If the mean sizes of the two subgroups both are not changed over time, then the larger the firm share of SMEs, the lower the aggregate mean size. Also, if there is no change in firm share and mean size of SMEs, then aggregate mean size reflects the change in mean size of large firms. Therefore, it is necessary to examine the trends about all classes of firm size.

The mean size of larger firms with more than 200 employees, and especially big firms with more than 1,000 employees shows a large decline in

Average Large Firm Size

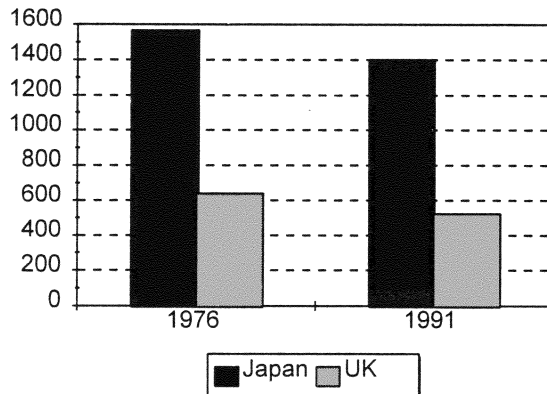


Fig. 7.

both Japan and the UK. For instance, *in Japan the average size of the very largest of firms (1000+) fell by 130 employees over the period. In the UK the average size of medium and large firms (200+) contracted by 115 employees.* The interesting feature to note was that larger Japanese firms were nearly three times the size of their UK equivalents. The declining trend in Japan is likely to be attributable to the reduction of domestic production and a shift in production away from Japan to overseas, and de-diversification or restructuring (for example outsourcing of parts and finished goods) among large firms. This finding is consistent with the change in trend toward “downsizing” found in the advanced countries.

By contrast, in Japan, among firms with 300–499 employees, the mean size tends to increase, suggesting growth in mid-sized firms referred to earlier. The result is consistent with the finding that SMEs are maintaining their aggregate market share, and also with the above-mentioned suggestion by Nakamura (1990).

On the other hand, the mean size of SMEs has not changed over the relevant period. This finding is worth noting. Innovations, as suggested earlier, are likely to reduce the size of SMEs, but this relationship has not been observed. Innovation rather might promote the expansion of SMEs, offsetting the reduction of firm size due to flexible manufacturing technologies. In addition, their expansion has been supported by the “destandardization of consumer tastes”; An increasing relative impor-

tance of customized products may have decreased the “inherent cost disadvantages of SMEs”.

If we focus on the polar extremes of firm size distribution in the first instance, there are some particularly interesting insights to be revealed. In the first instance, *in the UK the average firm size in the largest (>200) category fell from 640 employees in 1976 to 525 in 1991*, which represents a significant downsizing for the average larger firm. Secondly, and equally important, *in the micro firm category (1–9) the average firm size was reduced from 4.7 employees in 1976 to 2.9 employees in 1991 in the UK compared to Japan where the average micro firm size remained constant at the 6 employee level.* The effect of this UK shift is important as the shift from 5 to 3 employees potentially has more wide-ranging implications for the way production is organised and upon firms strategies and conduct that the shift from 639 to 525 employees reported in larger firms. However, it is important to stress at this juncture that although the number of firms increased by nearly 33% over this period, primarily due to an expansion in the number of micro-businesses, UK manufacturing also suffered a decrease in total employment of 33.8% representing some 2,428,537 employees. Thus the greater part of employment creation can be traced back to the influx of micro firms over this period, yet this was overshadowed to some extent, by a huge decline in large firm employment.

Whilst this change can in part be explained by a lack of international competitiveness in the large firm sector, the increased use of technology combined with shorter more flexible production runs and increased subcontracting out of production appears to have played a significant part in the downsizing of firms in UK manufacturing. This once again raises the question as to whether an industrial policy designed at creating a flexible, small firms based economy is the correct one when compared to the Japanese style policy of creating industrial giants capable of competing globally supported by networks of efficient small firm subcontractors. Indeed Storey (1994) argues that ‘such policies can only be justified in a market economy where it can be demonstrated that the effect of government intervention is to lead to an overall net improvement in welfare’ and further, that, ‘if small firm policy intention leads to an

increase in the number of small firms, but also to a compensating reduction in employment in large-firms, then it is difficult to justify such policies on welfare grounds'. However, Bannock and Peacock (1989) stress the positive effect of small firms on competition and suggest that where there is a continuous stream of new entrants prices are driven down to competitive levels thus preventing large firms from extracting above normal profits. This question is the subject of another paper funded under this research programme.

IV. Conclusion

An attempt has been made to present and compare the level and trend in aggregate share of SMEs in Japanese and UK manufacturing in terms of the firm size distribution and the employment share distribution. It was found that there is a large difference in aggregate industrial organisation of the SME sector between the two countries. To summarise the major findings, in Japan SMEs have been increasing in number at a faster rate than larger firms. This contrasts with the UK where only micro businesses increased in absolute numbers, thus increasing their relative share out of the total firm population.

On employment shares, in Japan SMEs maintained a stable share of total manufacturing employment, and also of total manufacturing output. In the UK SMEs increased their share of employment over a period when total employment in manufacturing fell significantly. The interesting feature was that the large firm share in the UK fell by 14% to 30% between 1976 and 1991 at a time when the small firms share rose by 9% to 34%. Thus the employment share of small firms using the Bolton definition was approximately 50% in 1991 in the UK. The equivalent figure for Japan is high and stable at 60%.

Thus, this paper exhibits some broad patterns which mirror SMEs sectors in Japanese and UK manufacturing industries respectively. SMEs dominate in terms of the number of firms in both the countries but in Japan SMEs are more important in employment terms than the UK. However, as total employment in UK manufacturing is in a longer term decline, it may be that unless the large firm sector reestablishes itself in world markets then the only source of employment generation is

in newly established micro businesses. In Japan the opposite appears to be the case. Here, all size classes of firm appear to share in the benefits of their relative international competitiveness, although there is evidence of an inverse relationship between firm size and the rate of growth in firm numbers.

This leaves a number of interesting areas which merit further attention by researchers. Firstly, an examination of the nature of the transaction structure between SMEs, particularly micro businesses, and large firms might shed some light on the reasons for this apparent complimentary co-evolution in Japanese manufacturing and the lack of such a pattern in the UK. Secondly, the question of UK manufacturing competitiveness and how this has changed given what we have observed about changes in the firm size distribution and employment shares. A third possibly fruitful area of investigation would be to examine birth and death rates in the two countries. Is it the case that small firms in Japan have low death rates compared to their UK counterparts and if so does this lead to the observed stability of small firms share of employment? Or is it the case that their is relatively little turbulence at the small firm level in Japan, which may be characterised by relatively low rates of new firm entry and exit. For the UK, there appears to be high rates of entry and high rates of death. What are the implications of this for the long-term evolution of manufacturing?

This preliminary, essentially statistical paper has attempted to provide us with a picture of the way in which manufacturing has evolved in Japan and the UK since 1972 as a means of clarifying what has occurred in the first instance, and secondly as a prelude to identifying further, more rigorous areas of empirical investigation. It is hoped that the contrasts between the two countries, one an internationally successful manufacturing country and the other an internationally declining power might stimulate research into the role of small firms in industrial organisation which, with some notable exceptions, has focused very specifically upon the large firm.

Acknowledgements

The authors would particularly like to thank two referees for detailed comments on the original

version of the paper and David Storey for considerable help in preparing this revised version. We would also like to acknowledge the generous support of the Nomura Social Science Research Fund. All remaining errors are our own.

Notes

¹ In fact, large firms sectors such as engineering which have vertical transactions with SMEs have larger international competitiveness.

Doi (1988) shows that the larger the ratio of subcontracting works of an industry, the higher its exports-sales ratio.

² Employment and sales shares of firms with fewer than 500 employees in the US manufacturing are respectively: 32.06 and 23.8 percent in 1980; 35.33 and 24.5 percent in 1984; 35.24 and 25.8 percent in 1986. See Acs and Audretsch (1993, pp. 69–70).

³ In recent years, there are an increasing number of joint R&D ventures between large firms and SMEs in Japanese manufacturing industries. Doi (1995) shows that more than half of sampled big firms have joint R&D partnerships with SMEs. The finding suggests that SMEs have a larger viability and competitiveness.

⁴ This definition is based on Lyons and Baily (1991, p. 102).

⁵ The distribution of establishments is not shown in this paper, since the distribution is similar to the counterpart of firms. See the Establishment Census in 1991.

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