Innovation and Business Performance: Small Entrepreneurial Firms in the UK and the EU

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Introduction

Entrepreneurship and innovation are high on the policy agenda. The EU and the OECD have each recently produced major policy oriented studies of these frequently twinned phenomena, and the recent 'Opportunity for All' White paper devoted a separate chapter to each (OECD (1998b) EU (2001) DTI (2001)). A comprehensive survey of the evidence on which policy can be based in this area is beyond the scope of a single paper, and is not attempted here. The purpose of this paper is, instead, to provide an overview of certain key aspects of the link between entrepreneurship innovation and business performance in a specific UK context. In doing this the paper first provides, however, an overview of the relative innovative performance of smaller firms in the UK in a comparative European perspective. It then seeks to examine the constraints smaller enterpreneurial firms face in their innovative activities and explores the impact of innovation in smaller firms on their growth and profitability.

The paper draws on work carried out for Eurostat in collaboration with my colleagues at the CBR at Cambridge using the data generated by the second harmonised European community innovation survey (CIS2)(Cosh and Hughes (2001)). I will also discuss some results of ESRC-funded survey-based small and medium sized enterprise (SME) research carried out at the CBR (Cosh and Hughes (1998) (2000a)). Finally it draws upon detailed case study work of my colleagues at the Judge Institute on benchmarking product innovation development activity in the UK Japan and the USA (Oliver et al (2000)).

Heterogeneity in the SME sector

Since the paper will analyse data relating to firms of different sizes and will compare broad groupings by size it is important to emphasise the broad range of business characteristics encompassed by most definitions of small businesses. Definitions using upper cut points in the hundreds of employees cover sole proprietorships to small quoted businesses. Moreover the sector will include hi-technology knowledge based firms and corner shops, as well as firms with high growth aspiration and other so-called 'life style businesses'. Generalisation across the sector as a whole is therefore dangerous, even though the data sources may at times permit little else.

The changing share of smaller businesses in the UK

Between 1979 and 1991 the share in UK employment of businesses employing less than 200 employees rose from 49.1% to 58.1%. This increase was mainly accounted for by increases in the share of businesses with less than 50 employees and especially those with less than 10 employees. Since 1991 the growth in the business population and the share of activity of businesses employing less than 200 has fallen then recovered, but has not advanced beyond the high point reached at the turn of the decade. Since 1991 the shares of activity in businesses with less than 10, and less than 50, employees appears to have stabilised. The growth of the entrepreneurial economy based on SMEs has therefore been highly concentrated amongst micro-firms at the tail end of the size distribution.

SME growth: the stylised facts

The extensive international data, which has emerged on patterns of business growth, reveal that smaller, younger businesses, which inhabit the tail of the size distribution, experience wider variations in growth rates than do larger, maturer ones. It also reveals that younger firms grow faster than other firms do and the very smallest grow faster than the rest. However only a handful of businesses will account for the bulk of employment, output or sales generated by a given cohort of surviving firms. It is not the case that the typical small firm generates more employment than larger firms do. Rather it is the case that a few small firms produce spectacular growth, which pulls the average up.

Keeping a sense of proportion

Despite the growing importance of smaller firms it is important in discussing their contribution to innovation and growth to note that economic activity remains heavily concentrated in a few giant firms. In the European Union it has recently been estimated that the mean share in activity of the largest four enterprises across a large sample of industries and countries was 20% with a maximum of 87%. These ratios appear to have been rising rather than falling in recent decades.

Measuring innovation

Any attempt to assess innovative activity and performance must begin with the definition of suitable metrics. These usually fall into the two categories of input and output measures. Inputs usually include expenditure on R&D, and measures of the staff employed in R&D. Output measures include patents and measures of the incidence of product, process and logistic innovations. Distinctions can also be drawn between innovation new to the firm, (which may be diffusing from a de novo innovation activity in another firm), and more novel innovation which is new to the firm *and* to the industry. Each of these may lead to measures of innovation intensity in terms of innovation counts, as well as measures based on the distribution of sales by novelty of product or service innovation.

Broadly speaking there are two approaches to obtaining data on innovation outputs. The "object" approach which focuses on patents or more directly on the analysis of specific innovative products or processes. This approach frequently uses the trade and technical press, and expert engineering/technologist evaluations of significance, novelty, or importance. In contrast the "subject" approach is based on an analysis of firms' own perceptions of their innovative activity. This approach underpins the Harmonised European Community Innovation Surveys which have been associated with the development of extensively piloted survey instruments designed to measure innovation at the level of the firm. There is evidence to suggest that the object approach

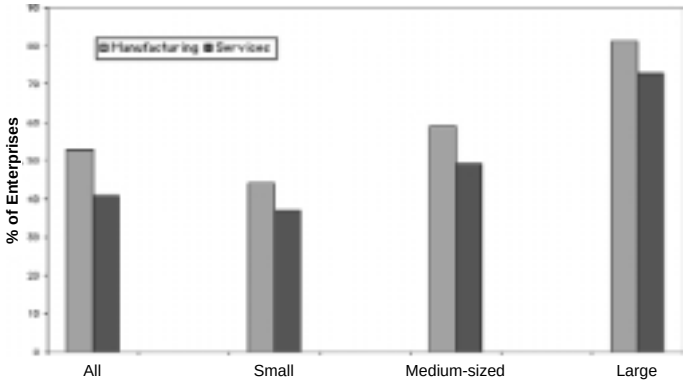
underestimates the innovative activity of smaller firms, in particular diffusion or incremental activity which the object approach may overlook (OECD (1992)). The CBR has pioneered the subject approach in relation to UK data for SMEs and consequently its work directly complements UK Office for National Statistics data collected for CIS2, which has along with many EU countries limited coverage of the smallest firms (Cosh, Hughes ands Wood (1998)). The discussion in the rest of this paper draws on data based on the subject approach.

Innovation in the EU

In reporting innovation activity in the EU this paper relies on the results of the second Community Innovation Survey (CIS2), of 1997/1998, from which charts 1 to 6 are drawn (Cosh and Hughes (2001)). Twelve European States took part in the survey (all EU Member States except Denmark, Greece, Italy and Portugal, plus Norway). The survey was intended to cover all enterprises in manufacturing with 20 or more employees and all service enterprises with 10 or more employees. These can be split into three size bands small (10 to 49 employees), medium (50 to 249 employees) and larger (250 or more employees). This allows a comparison of innovation activity by broad sector and size over the three-year period 1995-7.

The results of CIS2 reveal that innovation activity rises with enterprise size in the EU as a whole. This is revealed in chart 1 which also shows that the result holds for both Manufacturing and Services. In the specific sense that the proportion of enterprises reporting one or more product or process innovations rises with size class it seems that bigger is better.

Chart 1: Enterprise Innovating EU 1996-7



These results are at an aggregate EU level; it is instructive to disaggregate them by country, as well as size. To do this and to illustrate the relative innovative activity of the small firms in the UK the following charts 2-6 rank countries in terms of innovation performance of small firms, weaker countries are at the left and performance rises as we move to the right. Successive charts report on the proportion of product or process innovating enterprises in manufacturing, and the proportion of product innovators in manufacturing. The same measures are then shown for services, and then the final two charts report on the proportion of novel product innovators in manufacturing, and the proportion turnover due to new or improved products. Taken together these charts reveal that UK small firms are ranked in the top 4 in Europe in Manufacturing, and in the top 5 in Europe in Services. Moreover an inspection of the column pattern for medium and larger firms also reveals that UK small firms do better relatively than UK large firms and especially better than medium firms. In that comparative sense smaller is better.

Chart 2: Innovation Activity in Manufacturing in the EU (innovating enterprises as a % of the number of enterprises) 1996

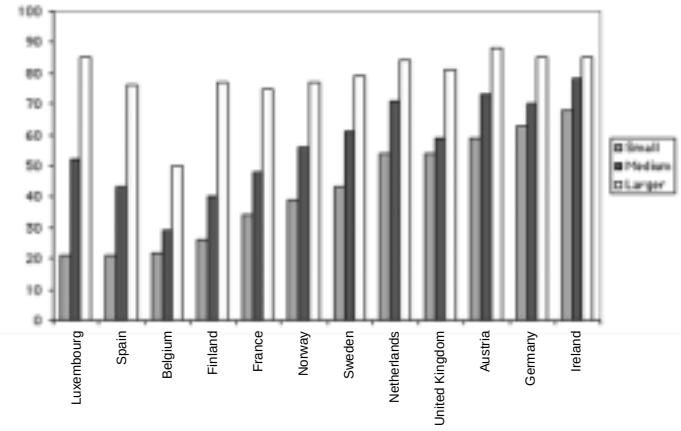


Chart 3: Product Innovation in Manufacturing in the EU (Product innovators as a % of the number of enterprises) 1996

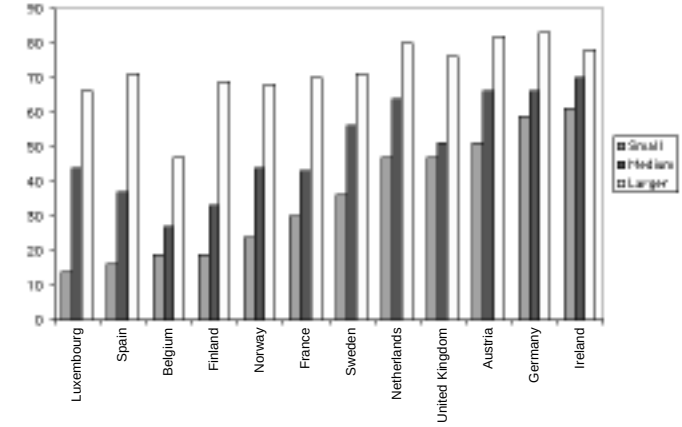


Chart 4: Innovation Activity in Services in the EU (innovating enterprises as a % of the number of enterprises) 1996

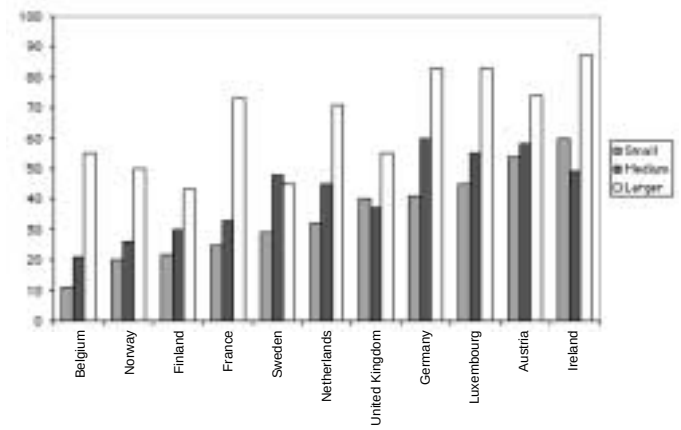


Chart 5: Original Product Innovation in Manufacturing in the EU (innovators with products also new to the market as a % of the number of enterprises) 1996

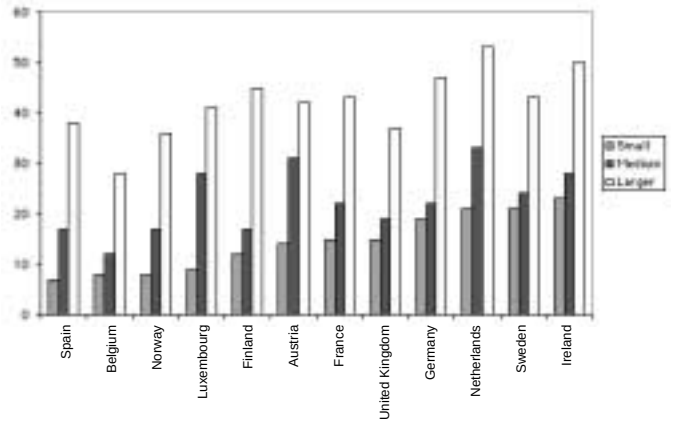
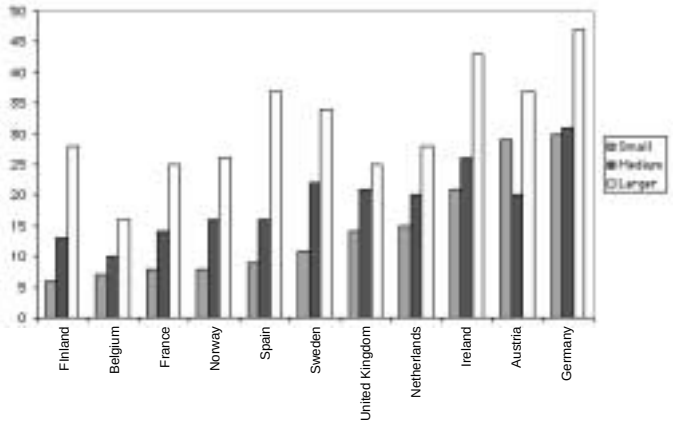


Chart 6: Turnover due to New or Improved Products in Manufacturing in the EU (As a % of total Turnover) 1996



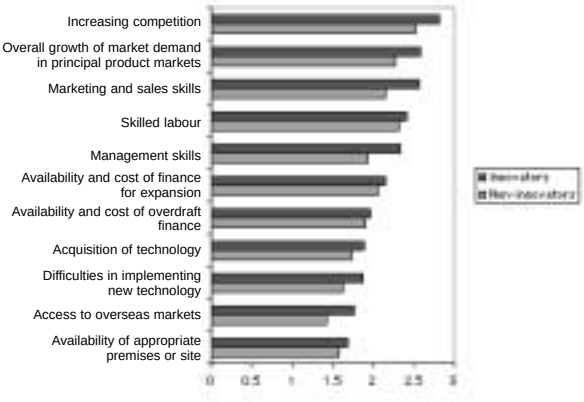
Analysis of innovation constraints and the innovation/ performance link using CBR survey results

In order to probe behind these results and in particular to examine patterns of innovation constraints and the innovation/performance link we can use the results of the regular CBR biennial survey of SMEs in the UK. These cover 2500 enterprises in Manufacturing and Business Services employing between 1 and 500 employees. The latest results are based on the 4th survey of 1999. The surveys generate subject-based data on innovation inputs and outputs and over 200 company specific variables on enterprise structure and performance. (A full discussion of the dataset and the results summarised here can be found in Cosh and Hughes (1998) and Cosh and Hughes (2000a)).

Innovation Constraints

Chart 7 drawn from Cosh and Hughes (2000b) compares the main constraints experienced by innovators and non-innovators in the CBR sample in meeting their business objectives. Innovation is measured by the presence or absence of a process or product innovation in the three-year period 1997-99. Each constraint was scored on a scale of 1-5. The length of the horizontal bars represents the mean scores recorded for each constraint by the sample firms in the two groups. The chart reveals that innovators in the UK SME sector feel more constrained in all dimensions than non-innovators. However, what is perhaps more interesting in view of the heavy emphasis placed upon financial constraints in recent policy debates is that they receive much less emphasis than demand and labour skill constraints. The biggest relative difference between innovators and non-innovators is that innovators feel much more constrained by lack of management, marketing and sales skills.

Chart 7: Constraints on ability to meet business objectives by age, growth and innovativeness in the UK. Mean scores based on a range of 1 to 5



Innovation and Performance: Survey Based Analysis

The impact of innovation on corporate performance has been the subject of an intensive and, especially amongst smaller firms where there are severe data problems, often-inconclusive literature. For smaller businesses this literature, often based on small or data restricted samples, suggests positive relationships between innovation and employment or turnover growth but weak or absent relationships with profitability (see for example Brouwer et al (1993), Cosh and Hughes (2000b), Cesaratto and Stirati (1996), Heunks (1998), Cosh Hughes and Wood (1999), Hughes and Wood (2000), Hoffman et al (1998), Tether (1997), Wynarczyk and Thwaites, (1997) and Roper (1997). For reviews and recent evidence of the large firm literature see Geroski and Machin (1992)(1993), OECD (1998b)).

To examine the link between innovation and performance in the CBR sample it is helpful first to look at the variations in innovation intensity measured by the proportion of sales accounted for by novel products or services. This is shown in chart 8, drawn from Cosh and Hughes (2000b), for all firms in the CBR sample and for various sub-samples defined by business age, sector, size and growth of employment in the past three years. For all sample firms around 7.4% of sales in 1999 were accounted for by recently introduced new products. This proportion was lower in stable/ declining firms compared to medium growers, in micro firms compared to small and medium SMEs, and in services compared to manufacturing.

Chart 8: Distribution of sales by novelty of product or service in 1999 in the UK

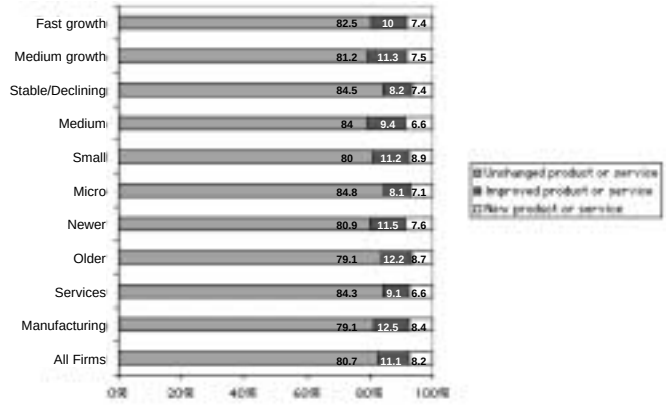


Table 1 draws on the panel nature of the CBR dataset (which tracks the same firms over time) to explore the link between innovation and performance. It reveals that past innovation intensity (measured as the percentage of sales accounted for by new products in 1997) is positively related to 1997-99 growth in our sample. Thus low innovation intensive firms with new products accounting for less than 10% of sales in 1997 had significantly lower employment and turnover growth rates in the subsequent three years. This result is largely driven by the manufacturing sub-sample. The differences in services, although in the same direction, are not statistically significant because of the wide variation in growth rates within the innovation groups.

The link between innovation and profitability is less clear cut. Table 2 presents median profit to sales margins for our innovation groups for all sample firms together, and split into three size categories and two sectors. This is to allow for possible aggregation biases arising from profit margin differences and changes in these groups. The table shows that median profit margins gradually fell between 1997 and 1999 for both high and low innovation intensive groups. The median rate of fall of profit margins was significantly different between the low- and high-innovation intensity firms only in the medium size group. In that group high-innovation intensity in 1997 had a positive relative impact on the change in profit margins 1997-99. In all other subgroups innovation intensity appeared to have no significant impact on subsequent changes in profit margins. These results are broadly in line with the wider literature referred to earlier. This raises important questions about why the bottom line outcomes are on average not more positive.

Table 1: The proportion of new products as a % of sales in 1997 and growth 1997-9

New Products as a % Sales 1997 All firms	Number of Firms	Median Employment Growth 1997-99	Median Turnover Growth 1997-9
Low (<10%)	560	1.0**	7.8**
High (≥ 10%)	358	10.2	14.1
Manufacturing			
Low (<10%)	331	0.0**	4.0**
High (≥ 10%)	234	9.1	11.4
Services			
Low (<10%)	229	5.0	13.2
High (≥ 10%)	124	14.3	22.5

An asterisk next to a number in a row indicates a significant difference from the number in the row below it (*significant at 10% level, ** significant at the 5% level or better)
Source: Cosh and Hughes (2000b).

Table 2: The proportion of new products in total sales in 1997 and profitability 1997-99

New Products as % of Sales 1997	Number of Firms 1997	Profit margin (median values) 1997	1999	% Change 1997-99
All Firms				
Low (< 10%)	555	12.6**	12.4**	-9.8
High (≥ 10%)	357	9.8	8.5	-12.1
Micro				
Low (< 10%)	264	20.0	20.2**	-6.3
High (≥ 10%)	121	19.1	15.5	-13.3
Small				
Low (< 10%)	236	9.8	8.8	-11.8**
High (≥ 10%)	184	8.4	7.3	-5.4
Medium				
Low (< 10%)	53	7.6	7.1	-11.6
High (≥ 10%)	52	7.5	6.1	-27.9
Manufacturing				
Low (< 10%)	330	10.6**	9.4**	-11.2
High (≥ 10%)	234	8.7	7.5	-12.3
Services				
Low (< 10%)	225	19.0**	20.0**	-7.0
High (≥ 10%)	123	12.8	14.4	-10.6

An asterisk next to a number in a row indicates a significant difference from the number in the row below it. (* significant at the 10% level, ** significant at the 5% level or better)
Source: Cosh and Hughes (2000b)

Innovation Product Development and Performance: An International Benchmarking Comparison

One of the most interesting developments in the theoretical and empirical analysis of business behaviour and innovative performance has been the increasing emphasis placed upon skill shortages, management competence and strategic response in relation to both innovation intensity and its links with financial performance (Foss, and Mahnke (2000) Dosi, Teece, and Chytry (1998), Utterback (1996) Barrell et al (2000)). It is therefore interesting to consider further the skill and management constraints experienced by innovative firms in meeting their business objectives. We do this by illustrating a specific connection in a UK context by drawing upon a recent study of product development performance in UK Japan and USA (Oliver et al (2000)).

The results relate to 38 medium sized consumer audio electronic firms in Japan, North America and USA and are based on comprehensive data on 31 new product development projects in these companies. The conventional 'uncommercial UK boffin' wisdom would suggest that UK firms would be slow to market compared with Japan. Table 3 confounds this view. The good news is that product lead times in this sample measured in terms of weeks to market, and engineering hours per new part were significantly lower in the UK than Japan. The bad news is that this haste brought much repentance. The number of weeks to achieve normal quality standards, and the number of warranty claims were far higher in UK firms.

Table 3: The Good News and the Bad on Product Development

The Good News . . .	Japan	UK
Product lead times to market in weeks	84	48
Engineering hours per new part	106	19
And The Bad News . . .		
Weeks to normal quality standards	2	8
Warranty claims per million parts	716	15419

Source: Based on data in Oliver et al (2000)

In assessing the UK's comparative competitive weaknesses and strengths the authors stress the lack of management competence

and professional marketing function with an international outlook. This has strong echoes in the wider survey-based results reported earlier and obvious implications for converting innovation into bottom line performance effects.

Conclusions

This paper has argued that, despite the growing importance of small entrepreneurial firms in economic activity, the UK (and all major industrial economies) still remains dominated by large firms. On average these larger firms are more innovation intensive than smaller firms. However, UK SMEs appear to be *relatively* more innovative in a comparative European context than are our larger firms. The paper also argued that in the UK and elsewhere only a handful of SMEs grow rapidly into large firms. It is therefore important to identify the central factors which lie behind that phenomenon and the particular links which may be made between innovation, and business growth and financial performance. In discussing these the paper noted that innovative SMEs in the UK are *relatively* more constrained by management skills than they are by financial market failures, and that management competence and skill issues may be a key factor in preventing innovation from producing systematically positive bottom line profitability effects.

It follows from this argument that an important emphasis in policy should be placed on building management competence in UK SMEs. In a related vein it is also important that policy should place greater emphasis on developing competence in the stock of businesses with growth aspirations, compared with an emphasis on the promotion of start-ups.

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