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Barriers to Innovation and Growth in High technology SMEs: the Role of Absorptive Capacity

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Executive Summary

Introduction

This report is concerned with identifying those factors which constrain small and medium-sized enterprises (SMEs) from attaining their full growth and innovative potential in high technology industries[1]. The report focuses in particular on those characteristics which reflect a firm's ability to recognise knowledge needs, obtain access to such relevant knowledge and absorb and utilise it effectively. We take these characteristics as measures of a firm's "absorptive capacity", or ability to explore access and exploit the knowledge base relevant to its innovative and competitive strategy. We group these characteristics under three headings: management, collaboration activities, sources of knowledge. We also examine their R&D activity. In addition to absorptive capacity characteristics we also attempt to distinguish successful from unsuccessful firms in these high technology industries in terms of their growth ambition, start-up and other market and competitive characteristics. We define success in terms of either growth or innovative performance. We also consider success in terms of combined growth and innovative performance. Our analysis is based upon existing survey-based databases of the SME sector in the UK held by the Centre for Business Research. Our analysis is primarily statistical. We do, however, use our survey-based samples to draw a sub-sample of companies which could serve as future case studies. These companies are selected to be exemplar companies in the sense that they represent particular combinations of growth and innovation which characterise our main sample findings. On the basis of a range of publicly

[1] Our high technology sectors are drawn both from manufacturing and from business services. They are sectors that are characterised by above average research and development expenditure to sales ratios and/or above average scientific and skill intensity in their labour forces. A full list of the sectors is included in Footnote 2 in the full report.

available information about these companies we use them to illustrate some of the findings emerging from our statistical analysis.

Before turning to the findings, some caveats are in order. First, as explained above, we are looking only at high technology sectors and so the average innovation benchmark is higher than if the whole small firm sector were included. Second, our analysis focuses on association rather than causation. The latter would require a fuller in-depth analysis than is possible within the confines of this short project. Third, the analysis has been carried out on a variable-by-variable basis and this may fail to take account of significant associations between them. However, when appropriate we take this into account in our discussion below and in the recommendations for further work.

Finally, it is important to note that this report is based on the views of the firms themselves as represented in their responses to the biennial SME survey carried out by the Centre for Business Research. In relation to measures of innovative performance this means that we are dealing with largely subjective measures of the firms' innovative activity. A range of innovation measures based on this approach are used. These relate to whether or not an innovation was introduced by the firm in the past three years was new to itself or new to the industry. Innovations new to the industry are termed *novel innovations*. Innovations new to the firm, but not to the industry represent *diffusion innovations*. We also can measure the intensity of innovation as captured by the percentage of sales which the firm reports is due to significantly new or improved products introduced in the last three years. Whilst all these measures are "subjective", they produce sectoral innovation patterns consistent with the use of more "objective" measures and are particularly reliable for within country comparisons. They are widely used both in the European Community Harmonised Innovation surveys (CIS) in the UK and Europe as well as in the CBR surveys of the SMEs sector.

The findings

In this section we present in turn the key characteristics of the firms in our study. Using tables which summarise the statistical results presented in sections 1-3 of the main report. We group our discussion of the characteristics of the sample firms in terms of growth and innovative performance, their ambitions, their management characteristics, the extent and nature of their collaborative activities and their range and use of knowledge sources. These sections cover our main absorptive capacity characteristics. This is followed by sections on the demand and competition characteristics of our firms and the financial and economic factors affecting their innovative and growth activity.

Performance

Fast growth firms and those carrying out novel innovations are somewhat larger but the differences in not significant by most size measures – size is not a barrier to growth and innovation (Table 1). Younger firms are more likely to be innovative and much more likely to be growing fast.

As would be expected, novel innovators have larger R&D inputs and a higher proportion of their sales going to new or improved products (Table 2). They are also more export intensive. Fast growth firms are not found to be more innovative in the sense of the incidence of innovation, but they have a higher proportion of sales due to new or improved products than other firms. Novel innovators are not found to be faster growing than other firms. In the wider population of small firms we tend to find an association between innovation and growth. We have not found this here when examining the incidence of novel innovation in the high technology sector, although it does appear in terms of the innovation intensity of sales. Some of our case study firms appear to have shown modest growth whilst continuing to be highly innovative.

This may be due to their growth ambitions, but also to the nature of their markets. Another remains innovative, but its growth has stalled due to problems in their principal market. On the other hand, high income elasticity niche markets can bring fast growth – and a third case study firm is benefiting from the growth in the number of super rich.

Ambitions

It is possible that the performance outcomes for firms may not be caused by factors that prevent their attainment of what we judge to be success, but instead by the firm having a different set of objectives. We attempt to assess this by examining the reason for business formation, their growth and innovation objectives and the purposes they give for seeking to innovate. Novel innovators are less likely to have founded the business due to the actual, or potential, unemployment of the founder, or to the desire to be their own boss (Table 3). They are more likely to have wanted to implement a new idea, but this difference is not statistically significant. This suggests that the ambitions and skills embodied in the formation of a business may have some influence on performance outcomes.

The CBR surveys have revealed the growing importance of buy-outs and spin-outs in new business formation. This brings to the new business a level of knowledge, qualifications and experience often not present in new start-ups. One case study firm was formed by a management buy-out from DEC and this gave it a head start in establishing its presence in the legal IT market.

Yet another resulted from a spin-out, but here the motivation appears to have been one best summarised by ‘small is beautiful’ and a haughty resistance to any form of external influence. This must hamper its potential for growth.

Novel innovators and fast growth firms also have higher current growth ambitions. Novel innovators are significantly more likely to seek to carryout further innovations, but do not differ from other firms in the objectives they seek to attain through innovation. For all firms gaining market share, extending the product range and improving product quality are the dominant innovation objectives. Fast growing firms are less likely to cite fulfilling regulations and raw material cost savings as innovative objectives.

Management

One of the factors that will influence the absorptive capacity of the firm is the quality and experience of its management team. This is of particular importance in the high technology sector where the appropriate interplay between commercial and scientific judgment is critical to the success of the firm. We find no difference in the age and experience of the CEO between novel innovators and other firms (Table 4). On the other hand, fast growth firms have younger and less experienced CEOs who are more likely to recognize that their management skills might inhibit attaining their business goals. They are more likely to still be run by their founder and this finding is even stronger for fast growth firms – the question of cause and effect is interesting, but cannot be answered here.

Neither innovators, nor fast growth firms show any differences in the qualifications of their CEO, nor do they in their perception of the barriers to innovation.

In other work by the CBR, the importance of management skills, the adoption of modern management methods and the choice of appropriate organizational forms have been shown to be associated with superior performance. We can see in our cases the differences between ‘technology-driven’ and ‘market-driven’ firms (Hendry et al, 2007), and the difficulty of making the transition from university spin-out to an effective commercial organisation.

The CBR has also established that innovative firms have a higher probability of being acquired than other firms and we have examples of this within our case study firms, where two firms have been acquired by overseas companies and it is important to understand better the reasons for these acquisitions and what happens to them following the takeovers. We also have an example of a UK firm using acquisition as a means of growth.

Collaboration

One method of tackling deficiencies in absorptive capacity is to collaborate with other organizations. Although we find some evidence that fast growth and novel firms are more likely to be engaged in collaboration, the differences in proportions are not great and sometimes not statistically significant (Table 5). Apart from the finding that novel innovators are more likely to collaborate with HEIs, there are no other consistent differences in the pattern of collaboration. It would appear that our 'less successful' firms are not failing due to a refusal to engage in collaboration. In summary, we find that collaboration is important, but does not, in this sample, distinguish between the successful and the unsuccessful except in the case of HEI collaboration.

Knowledge Sources

Do fast growth and innovative firms make greater use of certain sources of knowledge than other firms? Do the less successful firms face higher knowledge, or information, barriers? The answers to these questions are summarised in Table 6. Regrettably this information was available only for 1997 but we find that suppliers were more important for fast growth firms as sources of knowledge. However, customers and clients were more important for novel innovators. Fast growth and innovative firms are significantly more likely to find consultancy firms to be an important source of knowledge.

Fast growth firms are more likely to cite the lack of information on technologies as a barrier to innovation; and non-innovators are more likely to cite the lack of technological opportunities (or their knowledge about these) as a barrier. Fast growth innovators give greater significance to virtually all sources of information and are significantly more likely to find this within the company group.

This provides some evidence that the successful firms are making more (and perhaps better) use of key information sources.

Resources

Firms may be motivated towards innovation and growth and have the right access to new knowledge, but still have their performance hampered by resource constraints. Novel innovators cannot be distinguished from other firms in constraints on business performance in terms of their labour skills, premises availability or technology acquisition and implementation (Table 7). These factors do not appear to account for the lack of innovation by other firms. However, the novel innovators point to their lack of sales and marketing skills as a more important constraint on their success than do other firms.

Fast growth firms are also concerned about sales and marketing skills, but do not differ from other firms in this respect. They are significantly more concerned about skilled labour shortages - a consequence of their fast growth. Those failing

to grow fast point relatively more strongly to the problem of acquiring premises and new technology as higher barriers than fast growth firms.

Demand and Competition

There are no strong differences in the degree of competition faced by fast growth firms and novel innovators than other firms; nor do they differ significantly in terms of their dependence on their largest customer. Novel innovators are more subject to overseas competitors and more concerned about access to overseas markets, but less concerned about the lack of customer responsiveness to innovation. The relationship between innovation and overseas competition is a robust and interesting finding, but leaves further questions about cause and effect.

What distinguishes fast growth firms from the rest is their lower concerns about demand growth and increasing competition. They are also less concerned about the lack of customer responsiveness to innovation. Of course, we cannot tell whether the failure of the firm to grow is due to worse demand and competitive conditions, or whether these factors are being used as an excuse.

Financial /Economic Factors

Another set of external constraints relate to financial and economic factors. Are firms that fail to innovate and grow constrained by such factors? Alternatively, do successful firms find themselves penalized by such barriers? Table 9 sheds light on these issues. The constraint due to the availability and cost of finance was not significantly different between the various groups of firms in either year. In fact, the only significant difference between fast growth firms and the rest is that they attach a lower importance to the pay-off period for innovation being too long.

Novel innovators were less constrained in their innovation by the lack of appropriate finance, the perceived riskiness of innovation and the uncertainty over its timing. Novel innovators gave the cost of innovation as the highest barrier, but this was not significantly different from other firms. This suggests that finance for growth and finance for innovation can be distinguished and it is the latter that remains a constraint. Novel innovation entails high risk and may have a long gestation period and there may be insufficient finance appropriate for this use.

Further work

There are three areas where this study might be taken further. First, the case study sample does provide several firms that would be worthwhile exploring further by face-to-face interviews. This would enhance the study of the fuel cell

sector by covering other sectors and by examining firms that have been in existence for a decade, or more. This work could contrast the firms that continue to exhibit dynamism with those with stalled growth. Second, the analysis should be carried out on a multivariate basis, drawing upon our univariate findings. Third, further work is needed on the direction of causation and the nature of the linkage between innovation and firm performance.

Policy implications

Despite these reservations about the interim nature of these findings, we can draw some policy implications. Before doing so we can ask whether the firms themselves can provide some guidance. Over the years we have asked our firms about their problems with and desires for government policy. The answers to this question in 2004 are summarised in Table 10. It shows very few differences between novel innovators and others in their desires for policy changes. On the other hand, the fast growth firms are less demanding in terms of policy changes than other firms and are significantly less concerned about employment legislation.

The distinction drawn in the Hendry et al report and here between technology driven and market driven firms is of particular importance amongst small high technology firms. The key role of management in making such choices and in managing the process of change between these states is reinforced here. In addition, we find some evidence for a shortage of appropriate finance for the innovative effort. It is not clear what this might be however. The government already commits annually nearly £8 billion in support of the SME sector of which £3.6 billion is concerned with reducing the tax burden on small businesses and reducing the need for risk premia in this sector by subsidizing investment in R&D and high risk venture capital investment. The case for further support would need to be carefully evaluated and focused.

One policy implication which breaks away from further subsidization is the use of a more targeted public procurement program. Public procurement can help to provide access to contract based cash flow and enhance access to further finance by establishing ‘reputation’. This approach would also help to move the orientation of management away from being technology driven to a market driven approach in response to the contract.

In other work, the CBR has demonstrated that UK support for smaller businesses is more widespread, but spread very thinly in comparison to the United States. The considerable amount of public finance support for business could be simplified and given a greater strategic focus by type of firm, type of market and type of technology. In this way the support might reach those with the greatest capacity to exploit their technologies and become significant players.

Our work in this report suggests that the key absorptive capacity areas for policy attention in relation to novel innovation are management, marketing and sales skills, and effective collaboration with customers as key innovation partners in the value chain. Market related factors which appear important in relation to novel innovation are exposure to overseas competitors so that trade related support policies are also relevant.

Table 1 Size Measures – summary findings

Comparisons	Employment	Turnover	Total assets	Exports	Age of firm
Fast and Novel	0	0	+ +	+ +	- -
Fast growth	0	0	+ +	0	- -
Novel Innovator	0	0	0	+ +	-

The table summarises the findings reported in full in the Main Report.
The rows report on differences between (1) fast-growth, novel innovators and other firms; (2) Fast growth firms and other firms; (3) novel innovators and other firms.
0 means that no statistically significant differences were found.
+ + (- -) indicates that the comparison groups was significantly greater (less) than other firms at the 5% level in either or both years.
+ (-) indicates that the comparison groups was significantly greater (less) than other firms at the 10% level in either or both years.

Table 2 Performance – summary findings

Comparisons	Novel innovator	Innovator	Turnover growth	Employment growth	Export intensity (%)	Labour productivity (%)	% Sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Fast and Novel	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+	+ +
Fast growth	0	0	+ +	+ +	0	+ +	+ +	0	0	0
Novel Innovator	+ +	+ +	0	0	+	+	+ +	+ +	+	+ +

The table summarises the findings reported in full in the Main Report.
The rows report on differences between (1) fast-growth, novel innovators and other firms; (2) Fast growth firms and other firms; (3) novel innovators and other firms.
0 means that no statistically significant differences were found.
+ + (- -) indicates that the comparison groups was significantly greater (less) than other firms at the 5% level in either or both years.
+ (-) indicates that the comparison groups was significantly greater (less) than other firms at the 10% level in either or both years.

Table 3 Ambitions – summary findings

	Business established due to:						Innovation objectives: (% significant or crucial)			
Comparisons	Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow substantially	% wishing to grow moderately or substantially	% intending to introduce innovation in next 3 years	Replacing phased out products	Extending product range	Reducing production lead times	Gaining new markets or market share
Fast and Novel	0	0	0	+ +	0	+ +	0	0	0	0
Fast growth	0	0	0	+ +	+ +	0	0	0	0	0
Novel Innovator	- -	-	0	+ +	+ +	+ +	0	0	0	0

	Innovation objective: (% significant or crucial)						
Comparisons	Reducing labour costs	Reducing materials consumption	Reducing energy consumption	Improving production flexibility	Improving product quality	Reducing environmental damage	Fulfilling regulations/ standards
Fast and Novel	0	0	0	0	0	0	0
Fast growth	0	- -	0	0	0	0	- -
Novel Innovator	0	0	0	0	0	0	0

The table summarises the findings reported in full in the Main Report.
The rows report on differences between (1) fast-growth, novel innovators and other firms; (2) Fast growth firms and other firms; (3) novel innovators and other firms.
0 means that no statistically significant differences were found.
+ + (- -) indicates that the comparison groups was significantly greater (less) than other firms at the 5% level in either or both years.
+ (-) indicates that the comparison groups was significantly greater (less) than other firms at the 10% level in either or both years.

Table 4 Absorptive capacity – management – summary findings

	CEO							Limitations:	Barriers to innovation: (% very significant or crucial)		
Comparisons	Age	Years with the business	Years as CEO	Science/ Eng degree	Another type of degree/ prof qualification	Founder	CEO changed	Management skills (% very significant or crucial)	Organisational rigidities	No need to innovate due to earlier innovations	Innovation too easy to copy
Fast and Novel	-	- -	- -	0	0	+ +	0	+ +	0	0	0
Fast growth	- -	- -	- -	0	0	+ +	0	+ +	0	0	0
Novel Innovator	0	0	0	0	0	+	0	0	0	0	0

Table 5 Absorptive capacity – collaboration – summary findings

	Collaboration with: (% of all firms)				
Comparisons	Collaborative arrangements in last 3 years	Suppliers	Customers	HEIs	Firms in same line of business
Fast and Novel	0	0	0	+	0
Fast growth	+	0	0	0	0
Novel Innovator	+ +	0	0	0	0

Definitions: see footnote to Table 2

Table 6 Absorptive capacity - knowledge sources – summary findings

	Sources of information: (% very significant or crucial)							
Comparisons	Within the firm	Within the group	Suppliers of materials/ components	Clients or customers	Competitors in your line of business	Consultancy firms	Universities/ HEIs	Govmnt/private non-profit research institutes
Fast and Novel	0	+ +	0	0	0	+	0	0
Fast growth	0	0	+	0	0	0	0	0
Novel Innovator	0	0	0	+	0	0	0	0

	Sources of information: (% very significant or crucial)					Barriers to innovation: (% very significant or crucial)		
Comparisons	Patent disclosures	Professional conferences/ journals/meetings	Fairs/ exhibitions	Trade associations, chambers of commerce	Computer based info networks	Lack of information on technologies	Lack of information on markets	Lack of technological opportunities
Fast and Novel	0	0	0	0	0	+ +	0	0
Fast growth	0	0	0	0	0	+ +	0	0
Novel Innovator	0	0	0	0	0	0	0	-

The table summarises the findings reported in full in the Main Report.
The rows report on differences between (1) fast-growth, novel innovators and other firms; (2) Fast growth firms and other firms; (3) novel innovators and other firms.
0 means that no statistically significant differences were found.
+ + (- -) indicates that the comparison groups was significantly greater (less) than other firms at the 5% level in either or both years.
+ (-) indicates that the comparison groups was significantly greater (less) than other firms at the 10% level in either or both years.

Table 7 Barriers - resource constraints – summary findings

	Limitations: (% very significant or crucial)					Innovation barrier:
Comparisons	Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site	Lack of skilled personnel
Fast and Novel	+ +	0	0	0	0	+ +
Fast growth	+ +	0	-	+	-	+
Novel Innovator	0	+	0	0	0	0

Table 8 Barriers - demand and competition – summary findings

				Limitations: (% very significant or crucial)			Innovation barrier:
Comparisons	% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition	Lack of customer responsiveness to innovation
Fast and Novel	0	0	+	+	0	- -	0
Fast growth	0	0	0	0	- -	-	-
Novel Innovator	0	-	+ +	+	0	0	-

Definitions: see footnote to Table 2

Table 9 Constraints - financial and economic – summary findings

	Limitation: (% very significant or crucial)			Barrier to innovation: (% very significant or crucial)			
Comparisons	Availability and cost of finance for expansion	Availability and cost of overdraft finance	Excessive perceived risk	Lack of appropriate sources of finance	Innovation costs too high	Pay-off period of innovation too long	Firm's innovation potential too small
Fast and Novel	0	0	0	0	0	0	0
Fast growth	0	0	0	0	0	- -	0
Novel Innovator	0	0	- -	- -	0	0	0

	Barrier to innovation: (% very significant or crucial)		
Comparisons	Innovation costs hard to control	Legislation, norms, regulations, standards, taxation	Uncertainty in timing of innovation
Fast and Novel	0	0	0
Fast growth	0	0	0
Novel Innovator	0	0	-

The table summarises the findings reported in full in the Main Report.
The rows report on differences between (1) fast-growth, novel innovators and other firms; (2) Fast growth firms and other firms; (3) novel innovators and other firms.
0 means that no statistically significant differences were found.
+ + (- -) indicates that the comparison groups was significantly greater (less) than other firms at the 5% level in either or both years.
+ (-) indicates that the comparison groups was significantly greater (less) than other firms at the 10% level in either or both years.

Table 10 Policy changes – summary findings

Comparisons	Tax changes	More support	Less employment legislation	Less red tape
Fast and Novel	0	0	0	0
Fast growth	0	0	-	0
Novel Innovator	0	0	0	0

Definitions: see footnote to Table 2

Full Report

0 Introduction

This report is designed to complement the in-depth case studies of firms in the UK fuel cell sector carried out by Chris Hendry and his team. The objective of this part of the study is to utilise the information held on the CBR databases (see Cosh and Hughes, 2007) about high technology SMEs to infer whether we can identify the key barriers to innovative success and growth and to identify what distinguishes those firms that have successfully overcome such barriers. It draws upon the review of the role of absorptive capacity (Cohen and Levinthal, 1990) in business success and the study by Bessant et al (2005) concerning the awareness of; access to and uses of external sources of knowledge and expertise.

Sample Selection[2]

Two samples have been selected to provide the test bed for this research. In each case the sample comprises firms within the high technology sectors as defined by Butchart (1987). The first group (the 1997 Sample) comprises firms that responded to our 1997 survey and were alive in 2004. The total sample is 84 firms of which 29 also replied to our survey in 2004. This samples also provides the 20 exemplar firms for our first stage mini case studies.

[2] Manufacturing:
manufacturing of plastics in primary form
manufacturing of basic pharmaceutical products
manufacturing of pharmaceutical preparations
manufacturing of office machinery
manufacturing of computers and other proc equipm.
manufacturing of electric motors, generators and transformers
manufacturing of electricity distribution and control apparatus
manufacturing of electronic valves, tubes and other electronic components
manufacturing of telephone and telegraph apparatus and equipment. and radio and electronic capital goods
manufacturing of television and radio receivers, sound or video recording or reproducing apparatus
manufacturing of medical and surgical equipment and orthopaedic appliances
manufacturing of instruments and appliances for measuring, checking, testing, navigating etc
manufacturing of industrial process control equipment
manufacturing of optical precision instruments
manufacturing of photographic and cinematographic equipment
manufacturing of aircraft and spacecraft

Business services:
telecommunications
hardware consultancy
software consultancy and supply
data processing
other computer related activities
r&d on natural sciences and engineering
r&d on social services and humanities

The second group (the 2004 Sample) comprises high technology firms that also carried out R&D in the year prior to the 2004 CBR survey and that responded to that survey. By definition this will overlap with Sample 1a above, but it gives a sample of about two hundred firms for analysis.

Outcomes

The analysis focuses on two outcomes of the firms' endeavours: **innovation** and **growth**. Innovation is measured and reported in the following ways:

- Whether the firm introduced a novel innovation in the previous three years (ie one new to its industry)
- Whether the firm introduced any innovation in the previous three years (ie new to that firm)
- The percentage of the firm's sales attributed to new, or substantially improved products
- The firm's engagement in R&D activity and its engagement of R&D staff and expenditure.

The first of the above is used to classify our sample of high technology firms between **novel innovators** and **others** for this first stage analysis.

Growth is also measured in a variety of ways and over several different periods. Here we report on the growth of:

- Turnover (ie sales)
- Employment.

We also report on the export intensity of firm sales and labour productivity measured as the ratio of turnover to employment. The sample is divided into **fast growth** firms and **others** on the basis of whether sales growth was greater that 20% over the relevant periods.

Finally, we examine a group of firms that satisfy both the novel innovator and fast growth criteria and term these **fast and novel (**but occasionally call them fast growth innovators); and they are compared with **other firms**.

This report separates our firms in both the 1997 Sample and the 2004 Sample into three pairs of groups on the basis of: (1) whether they were novel innovators, or not; and (2) whether they were fast growth firms, or not; and (3) whether they were fast growth and novel innovators, or not. We can then compare the characteristics of firms in terms of their success in innovation and growth in each of the samples. This work is particularly concerned with identifying the constraints they face, particularly those constraints that relate to their absorptive capacity, and so the comparison of constraints across the groups is of particular importance.

Constraints

Our sample firms may not be successful in the terms of their innovation and growth simply because they have different success metrics. We try to capture this under the heading of Ambition. Alternatively, they may share the same objectives, but be frustrated in their efforts due to constraints that are internal to the firm. We capture these under the heading of Absorptive Capacity and have three groupings of factors: management; collaboration; and knowledge sources. There are other constraints that may be judged to be external to the firm and we group these under three further headings: resource constraints; financial and economic constraints; and markets and competitive constraints. The various measures available to us under these various constraints are listed below.

Ambition

- Business established: potential unemployment of founder
- Business established: desire of founder to run own business
- Business established: desire to implement new idea
- Innovation objectives: replacing phased out products
- Innovation objectives: extending product range
- Innovation objectives: reducing production lead times
- Innovation objectives: gaining new markets or market share
- Innovation objectives: reducing labour costs
- Innovation objectives: reducing materials consumption
- Innovation objectives: reducing energy consumption
- Innovation objectives: improving production flexibility
- Innovation objectives: improving product quality
- Innovation objectives: reducing environmental damage
- Innovation objectives: fulfilling regulations/standards
- Will you introduce innovations in products or processes?
- Business growth objective.

Absorptive Capacity

Management

- CEO: years with the business
- CEO: years as CEO
- CEO age
- Does CEO hold a science/Eng degree
- Has the CEO changed between 1997 and 2004?
- Limitations: management skills
- Has firm engaged in collaborative arrangements in last 3 years?
- Barriers to innovation: organisational rigidities
- Barriers to innovation: no need to innovate due to earlier innovations

- Barriers to innovation: innovation too easy to copy

Collaboration

- Any collaborative arrangements ?
- Collaboration with: suppliers
- Collaboration with: customers
- Collaboration with: HEIs
- Collaboration with: firms in same line of business

Knowledge Sources

- Internal sources: within the firm
- Internal sources: within the group
- External sources: suppliers of materials/components
- External sources: clients or customers
- External sources: competitors in your line of business
- External sources: consultancy firms
- External sources: universities/HEIs
- External sources: govnt/private non-profit research institutes
- External sources: patent disclosures
- External sources: professional conferences/journals/meetings
- External sources: fairs/exhibitions
- External sources: trade associations, chambers of commerce
- External sources: computer based info networks
- Barriers to innovation: lack of information on technologies
- Barriers to innovation: lack of information on markets
- Barriers to innovation: lack of technological opportunities

Resource constraints

- Limitations: skilled labour
- Limitations: marketing and sales skills
- Limitations: acquisition of technology
- Limitations: difficulties in implementing new technology
- Limitations: availability of appropriate premises or site
- Barriers to innovation: lack of skilled personnel

Finance and Economic constraints

- Limitations: availability and cost of finance for expansion

- Limitations: availability and cost of overdraft finance
- Barriers to innovation: excessive perceived risk
- Barriers to innovation: lack of appropriate sources of finance
- Barriers to innovation: innovation costs too high
- Barriers to innovation: pay-off period of innovation too long
- Barriers to innovation: firm's innovation potential too small
- Barriers to innovation: uncertainty in timing of innovation
- Barriers to innovation: innovation costs hard to control
- Barriers to innovation: legislation, norms, regulations, standards, taxation

Market and Competition

- % of sales due to largest competitor
- No of serious competitors
- No of serious competitors that are overseas
- Limitations: access to overseas markets
- Limitations: overall growth of market demand in principal product markets
- Limitations: increasing competition
- Barriers to innovation: lack of customer responsiveness to innovation

Analysis

The next three sections report of the findings from the comparison of each of the three pairs of groups in turn. They are compared on the basis of their: size and performance; ambition; management characteristics; collaboration; access to knowledge sources; resource constraints; finance and economic constraints; competitive position; and their policy needs. The findings are summarised in the Executive Summary for this report.

Case Study Companies

The principal analysis in this study is the comparison of the firms grouped on the basis of their success in both the 1997 and 2004 samples as described above. However, we also suggested that it might be worth using our data to identify certain companies that could form a part of further in-depth case studies outside the fuel cell sector. In order to progress this we have selected twenty companies from the 1997 Sample, half of which also form part of the 2004 Sample. We have then provided thumbnail sketches of each of these firms in Appendix 1. The purpose of this work is to provide enough information to choose whether the firms would be worthy of a more in-depth study.

References

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1 Barriers to Innovative Performance

The samples are divided into two groups in both 1997 and 2004 on the basis of whether the firm introduced a novel innovation in the previous three years. We examine the differences between these groups in terms of the constraints identified in the previous section. First, we examine the size and performance characteristics of the samples.

Sample Size and Size Measures

Table 1.1 reveals that the 1997 sample has about ninety firms and the 2004 Sample has about 190 firms. The novel innovators are confirmed as being somewhat larger than other firms in terms of employment, turnover and assets, but these differences are not statistically significant. Despite being larger, they are somewhat younger than the non-innovators. Exports (and export intensity) are higher for the novel innovators. This demonstrates that the groups overlap.

Table 1.1 Size Measures

1997 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Novel Innovator	Mean	51	65.2	4933.0	2305.5	1094.3	19.5
	Median		40.0	2203.0	1241.5	281.0	13.0
Other Firm	Mean	37	60.3	3096.4	2314.7	520.5	32.8
	Median		50.0	2340.0	1301.5	100.0	20.0
	Sign.						*

2004 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Novel Innovator	Mean	133	70.5	6530.8	6472.6	3101.4	20.5
	Median		38.0	3404.5	2312.0	480.0	17.0
Other Firm	Mean	59	42.4	4489.8	4513.0	789.3	23.0
	Median		33.0	2500.0	1927.0	58.0	18.0
	Sign.					**	

N.B. The significance tests throughout are tests of differences in the medians. Monetary values are shown in £,000 unless specified otherwise.

Performance

Apart from the obvious differences between the groups in terms of their innovation achievements, the groups do not differ significantly in terms of sales growth. The novel innovators do have significantly higher R&D activity and have a significantly higher proportion of their sales going to new and significantly improved products. They are all significantly more export intensive.

Table 1.2 Performance

1997 Sample		Novel innovator 97	Innovator 97	Turnover growth 94-97	Employment growth 94-97	Export intensity (%) 97	Labour productivity (%) 97	% sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Novel Innovator	Mean	1.0	1.0	69.0	49.7	26.1	7232.8	49.6	91.7	15.0	10.0
	Median	1.0	1.0	31.7	21.5	15.3	5696.2	50.0	100.0	9.1	4.5
Other Firm	Mean	0.0	0.6	111.8	52.5	15.4	5874.6	21.9	52.8	3.8	2.1
	Median	0.0	1.0	30.0	16.0	3.8	4840.0	0.0	100.0	0.0	0.0
	Sign.	**	**			*	*	**	**	**	**

2004 Sample		Novel innovator 04	Innovator 04	Turnover growth 01-04	Employment growth 01-04	Export intensity (%) 04	Labour productivity (%) 04	% sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Novel Innovator	Mean	1.0	1.0	473	24.2	30.2	9899.5	54.6	99.3	17.3	9.6
	Median	1.0	1.0	18.6	3.3	17.1	7966.1	50.0	100	11.7	6.0
Other Firm	Mean	0.0	0.8	52.1	27.4	23.6	10537.6	32.0	89.9	15.1	3.4
	Median	0.0	1.0	10.7	7.0	5.5	6892.9	25.0	100	10.4	1.6
	Sign.	**	**			*		**	**		*

Ambitions

Looking first at the reasons for business formation, Table 1.3 shows that novel innovators in 1997 were significantly less likely to have established the business as a result of the actual, or potential, unemployment of the founder. They are also less likely to have formed the business simply to be their own boss. Instead, they were more likely to have founded the business to implement a new idea, but this difference is not statistically significant.

In addition, novel innovators in both periods are significantly more likely to seek to grow their businesses substantially (and to seek further innovations in 1997). Taken with the findings above, we can infer that novel innovators are more serious in developing their business beyond simply self-employment income than other firms.

When we compare the innovation objectives of the two groups in 1997, there are few significant differences between the groups in terms of their rankings or their level.

Absorptive Capacity – Management

This section explores the absorptive capacity of the business to carry out significant innovations in terms of its management capacity. There are some surprising findings. There is little difference between our novel innovators and others in terms of the age and experience of the CEO. Table 1.4 shows also that these groups do not differ in terms of the CEO's qualifications.

The only significant difference found is that in the 1997 Sample (the data are not available for 2004), the novel innovator is significantly more likely to still be run by its founder. Novel innovators are more likely to cite their lack of management skills as a constraint on achieving their business objectives, but the differences are not significant. Similarly, whilst novel innovators are less likely to cite organizational rigidities, innovation imitation and innovation complacency as barriers to innovation, the differences are small and insignificant.

Absorptive Capacity – Collaboration

Table 1.5 shows that novel innovators are more likely to have collaborated and generally collaborate more frequently with suppliers, customers and HEIs – but rarely are these differences statistically significant. Indeed, in the 2004 Sample there is no difference between the groups in their degree of collaboration overall and the non-novel-innovators were more likely to have collaborated with firms in the same line of business. In interpreting these findings it should be remembered that all of these firms are in the high technology sector and that 80% of the not novel innovator group in 2004 had introduced some form of innovation in the previous three years.

Table 1.3 Ambitions

		Business established due to:					Innovation objectives: (% significant or crucial)			
1997 Sample		Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow moderately or substantially	% wishing to grow substantially	% intending to introduce innovation in next 3 years	Replacing phased out products	Extending product range	Reducing production lead times
Novel Innovator	Mean	28.1	66.7	69.4	100.0	46.0	93.9	43.2	69.6	35.6
	Median	0.0	100.0	100.0	100.0	0.0	100.0	0.0	100.0	0.0
Other Firm	Mean	60.0	85.7	47.4	83.8	10.8	65.7	33.3	61.9	33.3
	Median	100.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
	Sign.	**	*		**	**	**			

		Innovation objective: (% significant or crucial)							
1997 Sample		Gaining new markets or market share	Reducing labour costs	Reducing materials consumption	Reducing energy consumption	Improving production flexibility	Improving product quality	Reducing environmental damage	Fulfilling regulations/ standards
Novel Innovator	Mean	80.9	21.3	15.9	4.6	39.1	76.1	17.1	48.9
	Median	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Other Firm	Mean	81.0	33.3	19.1	14.3	33.3	81.0	9.5	47.6
	Median	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
	Sign.								

		Business established due to:				
2004 Sample		Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow moderately or substantially	% wishing to grow substantially
Novel Innovator	Mean	20.3	65.9	50.8	94.7	52.7
	Median	0.0	100.0	100.0	100.0	100.0
Other Firm	Mean	27.6	75.4	34.5	91.2	22.8
	Median	0.0	100.0	0.0	100.0	0.0
	Sign.					**

Table 1.4 Absorptive capacity – management

1997 Sample		Age	Years with the business	CEO Years as CEO	CEO Science/ Eng degree	CEO Another type of degree/ prof qualification	Founder	Limitations: Management skills (% very significant or crucial)	Barriers to innovation: (% very significant or crucial) Organisational rigidities	No need to innovate due to earlier innovations	Innovation too easy to copy
Novel Innovator	Mean	49.5	16.1	12.0	42.0	37.5	74.0	25.0	4.3	4.6	4.6
	Median	47.0	12.0	10.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	50.6	16.3	12.7	40.0	48.5	55.6	20.0	8.6	8.3	11.4
	Median	51.0	16.5	12.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
	Sign.						*				

2004 Sample		Age	Years with the business	CEO Years as CEO	CEO changed	Limitations: Management skills (% very significant or crucial)
Novel Innovator	Mean	53.0	15.3	13.2	8.3	20.5
	Median	53.0	14.0	12.0	0.0	0.0
Other Firm	Mean	51.8	17.5	14.5	17.6	20.3
	Median	52.0	16.0	13.0	0.0	0.0
	Sign.					

Table 1.5 Absorptive capacity – collaboration

			Collaboration with: (% of all firms)			
1997 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Novel Innovator	Mean	62.0	22.0	24.0	12.0	38.0
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	37.8	16.2	29.7	2.7	27.0
	Median	0.0	0.0	0.0	0.0	0.0
	Sign.	**				

			Collaboration with: (% of all firms)			
2004 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Novel Innovator	Mean	65.9	40.9	43.2	27.3	34.1
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	69.5	40.7	32.2	25.4	42.4
	Median	100.0	0.0	0.0	0.0	0.0
	Sign.					

Absorptive Capacity – knowledge sources

This information is available only for the 1997 Sample. Table 1.6 shows that novel innovators regard their own organizations, customers, consultancy firms, HEIs and a number of other sources as more important than do non-innovators. However, this difference is only significant for customers – here we find that 56.5% of novel innovators find customers to be a very significant, or crucial, source of information for innovation. By contrast, only 6.5% find HEIs to have this level of importance. We have evidence from other work we have carried out that this proportion has increased since that time in the same way as we found above for business collaboration with HEIs.

When we look at information barriers to innovation, the only significant difference is that the firms that were not novel innovators were much more likely to claim that a lack of technological opportunities for innovation stood in their way.

Barriers – resource constraints

Are firms prevented from achieving novel innovations by resource constraints? Table 1.7 explores whether we can explain the lack of novel innovation by resource constraints. There is a remarkable similarity between the two groups. Novel innovators appear to suffer the same degree of limitations on attaining their business objectives as other firms. The only significant difference is the higher importance attached to marketing and sales skills by the novel innovators group of firms.

Barriers – demand and competition

Novel innovators are not significantly different in their dependence on their largest customer, or in the overall degree of competition they face. On the other hand, novel innovators have more serious overseas competitors. In terms of limitations on attaining their business objectives, Table 1.8 shows that access to overseas markets is a bigger limitation for novel innovators, but that the growth of demand and degree of competition is not significantly different. Those firms that did not carry out a novel innovation leading up to 1997 are significantly more likely to attribute this to the lack of customer responsiveness to innovation – they were less engaged in collaboration with customers. It is clear that the customers of SMEs are a key support to the innovation process.

Constraints – financial and economic

The findings shown in Table 1.9 are clear. Financial constraints on achieving their business objectives do not differ significantly between the groups – novel innovators show lower constraints in 1997, but higher in 2004; but none of the differences are statistically significant. The picture changes when we turn to constraints on innovation. Here we find that the not-novel group rates each constraint more highly and the difference is statistically significant in the case of: perceived risk; appropriate finance; and uncertainty over the timing of innovation.

Policy Changes sought

There is no evidence here for the suggestion that novel innovators look for a different set of government policy changes, or that the proportion seeking such changes differs, when compared with other firms in the sample.

Table 1.6 Absorptive capacity - knowledge sources

1997 Sample		Sources of information: (% very significant or crucial)							
		Within the firm	Within the group	Suppliers of materials/ components	Clients or customers	Competitors in your line of business	Consultancy firms	Universities/ HEIs	Govmnt/private non-profit research institutes
Novel Innovator	Mean	81.6	22.2	29.2	56.5	20.0	10.9	6.5	8.9
	Median	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	71.4	14.3	33.3	33.3	19.1	0.0	0.0	4.8
	Median	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.				*				

1997 Sample		Sources of information: (% very significant or crucial)					Barriers to innovation: (% very significant or crucial)		
		Patent disclosures	Professional conferences/ journals/meetings	Fairs/ exhibitions	Trade associations, chambers of commerce	Computer based info networks	Lack of information on technologies	Lack of information on markets	Lack of technological opportunities
Novel Innovator	Mean	2.3	13.3	21.7	6.7	10.9	12.8	21.7	8.9
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	0.0	4.8	14.3	0.0	4.8	8.6	20.0	22.9
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.								*

Table 1.7 Barriers - resource constraints

1997 Sample		Limitations: (% very significant or crucial) Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site	Innovation barrier: Lack of skilled personnel
Novel Innovator	Mean	20.8	43.8	8.2	8.2	10.2	25.0
	Median	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	20.0	25.7	8.8	14.3	11.4	22.9
	Median	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.		*				

2004 Sample		Limitations: (% very significant or crucial) Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site
Novel Innovator	Mean	20.3	22.7	28.8	4.5	14.4
	Median	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	20.3	22.0	37.3	6.7	10.2
	Median	0.0	0.0	0.0	0.0	0.0
	Sign.					

Table 1.8 Barriers - demand and competition

1997 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Limitations: (% very significant or crucial) Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition	Innovation barrier: Lack of customer responsiveness to innovation
Novel Innovator	Mean	35.4	8.7	43.9	19.2	33.3	21.3	13.0
	Median	0.0	5.0	50.0	0.0	0.0	0.0	0.0
Other Firm	Mean	30.6	9.7	19.9	8.6	20.0	22.9	30.6
	Median	0.0	5.0	0.0	0.0	0.0	0.0	0.0
	Sign.			**				*

2004 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Limitations: (% very significant or crucial) Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition
Novel Innovator	Mean	26.2	7.5	53.1	8.3	10.6	27.3
	Median	0.0	5.0	50.0	0.0	0.0	0.0
Other Firm	Mean	29.8	46.0	36.1	1.7	11.9	35.6
	Median	0.0	5.0	20.0	0.0	0.0	0.0
	Sign.		*	**	*		

Table 1.9 Constraints - financial and economic

1997 Sample		Limitation: (% very significant or crucial)		Barrier to innovation: (% very significant or crucial)				
		Availability and cost of finance for expansion	Availability and cost of overdraft finance	Excessive perceived risk	Lack of appropriate sources of finance	Innovation costs too high	Pay-off period of innovation too long	Firm's innovation potential too small
Novel Innovator	Mean	20.4	18.4	17.0	16.7	34.0	22.2	29.8
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	28.6	17.1	44.1	37.1	50.0	33.3	37.1
	Median	0.0	0.0	0.0	0.0	50.0	0.0	0.0
	Sign.			**	**			

1997 Sample		Barrier to innovation: (% very significant or crucial)		
		Innovation costs hard to control	Legislation, norms, regulations, standards, taxation	Uncertainty in timing of innovation
Novel Innovator	Mean	19.6	13.6	8.9
	Median	0.0	0.0	0.0
Other Firm	Mean	25.7	17.1	22.9
	Median	0.0	0.0	0.0
	Sign.			*

2004 Sample		Limitation: (% very significant or crucial)	
		Availability and cost of finance for expansion	Availability and cost of overdraft finance
Novel Innovator	Mean	31.1	18.9
	Median	0.0	0.0
Other Firm	Mean	22.0	13.6
	Median	0.0	0.0
	Sign.		

Table 1.10 Policy changes

2004 Sample		Tax changes	More support	Less employment legislation	Less red tape
Novel Innovator	Mean	31.6	26.3	16.5	30.8
	Median	0.0	0.0	0.0	0.0
Other Firm	Mean	28.8	25.4	13.6	33.9
	Median	0.0	0.0	0.0	0.0
	Sign.				

2 Barriers to Growth

The samples are divided into two groups in both 1997 and 2004 on the basis of whether the firm had grown rapidly in the previous three years. We examine the differences between these groups in terms of the constraints identified in the previous section. First, we examine the size and performance characteristics of the samples.

Size Measures

Table 2.1 reveals that the fast growth group of firms are somewhat larger than other firms in terms of median employment, turnover, assets and exports, but these differences are not statistically significant except for total assets in the 2004 sample. The fast growth firms are also younger on average.

Table 2.1 Size Measures

1997 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Fast Growth Firm	Mean	44	66.2	3972.8	2360.5	1172.7	24.6
	Median		55.0	2950.0	1589.0	204.0	16.5
Other Firm	Mean	45	74.0	5133.8	2564.0	808.4	28.2
	Median		40.0	2220.5	1232.0	95.0	20.0
	Sign.						

2004 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Fast Growth Firm	Mean	111	69.1	7120.2	8213.8	3086.9	15.5
	Median		40.0	3198.5	2725.0	133.0	12.0
Other Firm	Mean	121	55.5	4881.1	3927.0	1665.5	26.6
	Median		37.0	3101.0	1924.0	250.0	21.0
	Sign.				**		**

Performance

Apart from the obvious differences between the groups in terms of their growth achievements, the groups do not differ significantly in terms of their innovation outcomes. Table 2.2 shows that fast growth firms do have higher labour productivity, but do not have a higher exports to sales ratio.

Table 2.2 Performance

1997 Sample		Novel innovator 97	Innovator 97	Turnover growth 94-97	Employment growth 94-97	Export intensity (%) 97	Labour productivity (%) 97	% sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Fast Growth Firm	Mean	0.5	0.8	167.1	94.8	22.5	7277.2	39.4	0.7	8.7	3.2
	Median	1.0	1.0	80.6	46.3	10.6	5732.7	40.0	1.0	4.2	2.3
Other Firm	Mean	0.6	0.8	4.2	9.6	20.8	6644.4	31.9	0.8	12.9	5.0
	Median	1.0	1.0	10.1	0.0	7.1	4486.6	20.0	1.0	5.3	1.0
	Sign.			**	**		**				

2004 Sample		Novel innovator 04	Innovator 04	Turnover growth 01-04	Employment growth 01-04	Export intensity (%) 04	Labour productivity (%) 04	% sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Fast Growth Firm	Mean	0.7	0.9	736.5	62.6	26.6	12143.9	54.1	1.0	16.7	5.8
	Median	1.0	1.0	72.2	33.8	9.0	8279.6	60.0	1.0	10.9	5.5
Other Firm	Mean	0.7	0.9	-30.0	-11.8	29.2	8205.7	41.3	1.0	15.4	5.5
	Median	1.0	1.0	-3.2	-10.3	16.7	6997.4	40.0	1.0	10.0	3.3
	Sign.			**	**		*	**			

Ambitions

Looking first at the reasons for business formation, Table 2.3 shows that fast growth firms were less likely to have established the business as a result of the actual, or potential, unemployment of the founder. They are more likely to have formed the business simply to be their own boss and to implement a new idea, but none of these differences are statistically significant.

In addition, fast growth firms in both periods are significantly more likely to seek to grow their businesses moderately, or substantially. In terms of innovation objectives we find there are few differences between fast growth and other, except that the latter are significantly more likely to have reducing materials consumption and fulfilling regulation as innovative objectives.

Absorptive Capacity – Management

The age and experience of the CEOs does not differ between the groups in the 1997 Sample. However the fast growth firms in 2004 have significantly younger CEOs who have had less business experience.

Table 2.4 shows that these groups do not differ in terms of the CEO's qualifications. The only significant difference found in the 1997 Sample is that the fast growth firm is significantly more likely to still be run by its founder. Fast growth firms are significantly more likely to cite their lack of management skills as a constraint on achieving their business objectives.

The table shows no significant differences between the groups in terms of their giving organizational rigidities, innovation imitation and innovation complacency as barriers to innovation.

Absorptive Capacity – Collaboration

Table 2.5 does not suggest that fast growth is associated with attitudes towards collaboration. Although in the judgement of the firms themselves, the importance of collaboration, particularly with HEIs has increased, there are no significant differences between the fast and slow growth firms in their degree, or type of collaboration.

Table 2.3 Ambitions

1997 Sample		Business established due to: Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow moderately or substantially	% wishing to grow substantially	Innovation objectives: (% significant or crucial) % intending to introduce innovation in next 3 years	Replacing phased out products	Extending product range	Reducing production lead times
Fast Growth Firm	Mean	30.8	78.8	71	97.4	38.5	89.2	34.5	71.0	37.9
	Median	0	100	100	100	0	100.0	0.0	100.0	0.0
Other Firm	Mean	38.1	70	60.9	87.2	20.5	76.9	46.7	60.0	30.0
	Median	0	100	100	100	0	100.0	0.0	100.0	0.0
	Sign.				*	*				

1997 Sample		Innovation objective: (% significant or crucial) Gaining new markets or market share	Reducing labour costs	Reducing materials consumption	Reducing energy consumption	Improving production flexibility	Improving product quality	Reducing environmental damage	Fulfilling regulations/ standards
Fast Growth Firm	Mean	76.7	20.0	7.1	7.1	34.5	80.0	21.4	35.7
	Median	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Other Firm	Mean	80.6	22.6	25.8	6.7	32.3	67.7	6.9	58.1
	Median	100.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0
	Sign.			**					**

2004 Sample		Business established due to: Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow moderately or substantially	% wishing to grow substantially
Fast Growth Firm	Mean	20.2	71.7	48.4	96.8	63.4
	Median	0	100	0	100	100
Other Firm	Mean	24.7	65.3	43.8	90.6	25
	Median	0	100	0	100	0
	Sign.				*	**

Table 2.4 Absorptive capacity – management

1997 Sample		Age	Years with the business	CEO Years as CEO	CEO Science/ Eng degree	CEO Another type of degree/ prof qualification	Founder	Limitations: Management skills (% very significant or crucial)	Barriers to innovation: (% very significant or crucial) Organisational rigidities	No need to innovate due to earlier innovations	Innovation too easy to copy
Fast Growth Firm	Mean	49.1	15.2	13.4	34.2	42.1	76.9	26.3	8.1	5.6	5.6
	Median	48.0	13.5	10.5	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	52.4	19.3	12.7	51.3	41.7	48.7	8.1	5.4	5.6	8.6
	Median	51.0	17.0	11.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.						**	**			

2004 Sample		Age	Years with the business	CEO Years as CEO	CEO changed	Limitations: Management skills (% very significant or crucial)
Fast Growth Firm	Mean	50.6	12.7	11.2	18.1	26.6
	Median	49.0	11.0	9.0	0.0	0.0
Other Firm	Mean	54.5	18.9	15.7	11.1	14.3
	Median	55.0	18.0	15.0	0.0	0.0
	Sign.	**	**	**		**

Table 2.5 Absorptive capacity – collaboration

			Collaboration with: (% of all firms)			
1997 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Fast Growth Firm	Mean	56.4	20.5	30.8	7.7	43.6
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	51.3	20.5	25.6	5.1	28.2
	Median	100.0	0.0	0.0	0.0	0.0
	Sign.					

			Collaboration with: (% of all firms)			
2004 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Fast Growth Firm	Mean	73.4	41.5	35.1	24.5	42.6
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	61.2	40.8	44.9	28.6	31.6
	Median	100.0	0.0	0.0	0.0	0.0
	Sign.	*				

Absorptive Capacity – knowledge sources

This information is available only for the 1997 Sample. Table 2.6 shows that fast growth firms regard their own organizations, customers, suppliers, consultancy firms and a number of other sources (but not HEIs) as more important knowledge sources for innovation than do slow growth firms. However, this difference is only significant for suppliers.

When we look at information barriers to innovation, the only significant difference is that the fast growth firms were much more likely to claim that a lack of information on technologies stood in their way.

Barriers – resource constraints

Table 2.7 explores whether we can explain the growth differences by resource constraints. Fast growth firms are experiencing higher constraints in terms of skilled labour and technology implementation. Slow growth firms point to lack of premises, or sites, and the acquisition of technology as a significantly more important constraint.

Barriers – demand and competition

Fast growth firms are not significantly different in their dependence on their largest customer, or in the overall degree of competition they face. In terms of limitations on attaining their business objectives, Table 2.8 shows that the growth of demand and degree of competition is seen as a greater problem by the slow growth firms, as we might expect.

Constraints – financial and economic

The findings concerning financial and economic constraints on firm growth are shown in Table 2.9. Financial constraints on achieving their business objectives are generally higher for the slow growth group, but the differences are not statistically significant.

The picture is similar when we turn to constraints on innovation, with the exception that the firm's view that its innovation potential is too small is given greater weight by the fast growth firms. The only statistically significant finding is the higher barrier to innovation due to the pay-off period from innovation being too long given by the slow growth group.

Policy Changes sought

There is no evidence here for the suggestion that fast growth firms in 2004 look for a different set of government policy changes, or that the proportion seeking such changes differs, when compared with other firms in the sample. The only marginally significant finding is that fast growth firms are less concerned about employment legislation.

Table 2.6 Absorptive capacity - knowledge sources

		Sources of information: (% very significant or crucial)							
1997 Sample		Within the firm	Within the group	Suppliers of materials/ components	Clients or customers	Competitors in your line of business	Consultancy firms	Universities/ HEIs	Govmnt/private non-profit research institutes
Fast Growth Firm	Mean	74.2	37.5	38.7	46.7	13.8	10.0	3.3	10.7
	Median	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	83.9	0.0	19.4	43.3	13.3	3.2	6.5	6.5
	Median	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.			*					

		Sources of information: (% very significant or crucial)					Barriers to innovation: (% very significant or crucial)		
1997 Sample		Patent disclosures	Professional conferences/ journals/meetings	Fairs/ exhibitions	Trade associations, chambers of commerce	Computer based info networks	Lack of information on technologies	Lack of information on markets	Lack of technological opportunities
Fast Growth Firm	Mean	3.6	10.3	26.7	6.9	10.0	16.2	22.2	16.2
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	0.0	6.7	13.3	3.3	13.3	2.7	24.3	8.6
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.						**		

Table 2.7 Barriers - resource constraints

		Limitations: (% very significant or crucial)					Innovation barrier:
1997 Sample		Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site	Lack of skilled personnel
Fast Growth Firm	Mean	21.6	39.5	8.1	13.2	7.9	31.6
	Median	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	13.5	29.7	5.3	2.7	7.9	13.5
	Median	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.				*		*

		Limitations: (% very significant or crucial)				
2004 Sample		Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site
Fast Growth Firm	Mean	26.6	20.2	25.5	5.3	8.5
	Median	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	14.1	24.5	36.7	5.1	17.3
	Median	0.0	0.0	0.0	0.0	0.0
	Sign.	**		*		*

Table 2.8 Barriers - demand and competition

					Limitations: (% very significant or crucial)			Innovation barrier:
1997 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition	Lack of customer responsiveness to innovation
Fast Growth Firm	Mean	30.8	13.9	33.4	18.4	21.1	23.7	13.5
	Median	0.0	4.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	29.0	9.8	29.2	8.1	43.2	25.0	29.7
	Median	0.0	5.0	21.5	0.0	0.0	0.0	0.0
	Sign.					**		*

					Limitations: (% very significant or crucial)		
2004 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition
Fast Growth Firm	Mean	31.9	9.5	48.3	8.5	10.6	23.4
	Median	0.0	5.0	50.0	0.0	0.0	0.0
Other Firm	Mean	22.7	29.4	47.0	5.1	11.2	35.7
	Median	0.0	5.0	50.0	0.0	0.0	0.0
	Sign.						*

Table 2.9 Constraints - financial and economic

1997 Sample		Limitation: (% very significant or crucial)		Barrier to innovation: (% very significant or crucial)				
		Availability and cost of finance for expansion	Availability and cost of overdraft finance	Excessive perceived risk	Lack of appropriate sources of finance	Innovation costs too high	Pay-off period of innovation too long	Firm's innovation potential too small
Fast Growth Firm	Mean	15.8	7.9	16.7	21.1	33.3	13.9	35.1
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	23.7	21.1	32.4	24.3	43.2	34.3	21.6
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.						**	

1997 Sample		Barrier to innovation: (% very significant or crucial)		
		Innovation costs hard to control	Legislation, norms, regulations, standards, taxation	Uncertainty in timing of innovation
Fast Growth Firm	Mean	22.2	11.1	16.2
	Median	0.0	0.0	0.0
Other Firm	Mean	21.6	17.1	14.3
	Median	0.0	0.0	0.0
	Sign.			

2004 Sample		Limitation: (% very significant or crucial)	
		Availability and cost of finance for expansion	Availability and cost of overdraft finance
Fast Growth Firm	Mean	24.5	18.1
	Median	0.0	0.0
Other Firm	Mean	31.6	16.3
	Median	0.0	0.0
	Sign.		

Table 2.10 Policy changes

2004 Sample		Tax changes	More support	Less employment legislation	Less red tape
Fast Growth Firm	Mean	27.7	21.3	10.6	27.7
	Median	0.0	0.0	0.0	0.0
Other Firm	Mean	33.3	31.3	20.2	35.4
	Median	0.0	0.0	0.0	0.0
	Sign.			*	

3 Barriers to Growth and Innovation

The samples are divided into two groups in both 1997 and 2004. One group was formed by those firms that had been both novel innovators and that had grown fast. The other group did not achieve both of these and may have achieved neither. We examine the differences between these groups in terms of the constraints identified in the previous sections. First, we examine the size and performance characteristics of the samples.

Size Measures

Table 3.1 reveals that the fast and novel group of firms are somewhat larger than other firms in terms of employment, turnover and assets in 2004, but these differences are not statistically significant except for total assets. The fast and novel group were younger on average in both years and the difference was significant in 2004.

Table 3.1 Size Measures

1997 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Fast and Novel	Mean	20	62.3	4049.2	2139.2	1723.1	17.0
	Median		41.0	3150.0	1892.5	370.0	12.0
Other Firm	Mean	54	71.4	4661.2	2581.4	647.4	31.1
	Median		50.0	2340.0	1264.0	90.0	20.0
	Sign.					**	

2004 Sample		No. of firms	Employment	Turnover	Total assets	Exports	Age of firm
Fast and Novel	Mean	67	77.5	8053.1	9325.1	3939.1	14.9
	Median		42.0	3397.0	3019.0	146.0	12.0
Other Firm	Mean	125	53.4	4737.2	4018.7	1534.6	24.7
	Median		37.0	3062.0	1892.0	250.0	19.0
	Sign.				**		**

Performance

Not surprisingly, the fast growth, novel innovators group exhibits higher average growth achievements and higher innovative inputs and outputs. Table 3.2 shows that fast growth innovators do have higher labour productivity and a higher exports to sales ratio.

Table 3.2 Performance

1997 Sample		Novel innovator 97	Innovator 97	Turnover growth 94-97	Employment growth 94-97	Export intensity (%) 97	Labour productivity (%) 97	% Sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Fast and Novel	Mean	1.0	1.0	134.3	83.7	31.4	7248.3	52.2	100.0	12.2	4.8
	Median	1.0	1.0	80.6	46.3	19.5	6532.4	50.0	100.0	8.8	3.8
Other Firm	Mean	0.4	0.7	69.0	38.3	17.9	6128.7	29.0	65.4	9.9	3.6
	Median	0.0	1.0	19.1	0.9	5.0	4643.0	20.0	100.0	3.0	0.5
	Sign.	**	**	**	**	**	**	**	**	*	**

2004 Sample		Novel innovator 04	Innovator 04	Turnover growth 01-04	Employment growth 01-04	Export intensity (%) 04	Labour productivity (%) 04	% Sales of new or improved products or services	% engaged in R&D in last year	% R&D staff	R&D intensity (%)
Fast and Novel	Mean	1.0	1.0	994.2	62.6	26.5	11960.8	64.7	100.0	15.0	12.4
	Median	1.0	1.0	71.7	28.3	9.2	8598.1	73.0	100.0	10.9	12.4
Other Firm	Mean	0.5	0.9	4.6	4.4	28.7	9089.3	38.5	94.4	16.1	5.1
	Median	1.0	1.0	0.0	15.5	15.5	7171.4	33.0	100.0	10.8	3.3
	Sign.	**	**	**	**		**	**	**		*

Ambitions

We find no significant differences between the fast growth innovators and other firms in terms of the reasons for business formation. Table 3.3 shows that fast growth innovators had higher growth and innovation ambitions for the future. We find no significant differences in the reasons for seeking to innovate.

Absorptive Capacity – Management

The age and experience of the CEOs does not differ between the groups in the 1997 Sample. However the fast growth innovators in 2004 have significantly younger CEOs who have had fewer years with their business and less time as CEO.

Table 3.4 shows that these groups do not differ in terms of the CEO's qualifications. The only significant difference found in the 1997 Sample is that the fast growth, novel innovators were significantly more likely to still be run by its founder. Fast growth innovators are significantly more likely to cite their lack of management skills as a constraint on achieving their business objectives.

The table shows no significant differences between the groups in terms of their giving organizational rigidities, innovation imitation and innovation complacency as barriers to innovation.

Absorptive Capacity – Collaboration

Whilst fast growth innovators were more like to have collaborated, the difference between the groups is not statistically significant. Although in the judgement of the firms themselves, the importance of collaboration, particularly with HEIs has increased, the significant difference between the fast growth novel innovators and other firms found in 1997 is not repeated in the 2004 sample. This may suggest that it is the quality of the collaboration that matters.

Table 3.3 Ambitions

		Business established due to:					Innovation objectives: (% significant or crucial)			
1997 Sample		Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow substantially	% wishing to grow moderately or substantially	% intending to introduce innovation in next 3 years	Replacing phased out products	Extending product range	Reducing production lead times	Gaining new markets or market share
Fast and Novel	Mean	25.0	75.0	72.2	65.0	100.0	100.0	38.9	85.0	47.4	84.2
	Median	0.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	0.0	100.0
Other Firm	Mean	42.9	72.1	61.3	18.5	88.9	75.0	40.5	56.8	29.7	78.9
	Median	0.0	100.0	100.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0
	Sign.				**		**				

		Innovation objective: (% significant or crucial)						
1997 Sample		Reducing labour costs	Reducing materials consumption	Reducing energy consumption	Improving production flexibility	Improving product quality	Reducing environmental damage	Fulfilling regulations/ standards
Fast and Novel	Mean	21.1	5.6	5.6	42.1	84.2	27.8	38.9
	Median	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Other Firm	Mean	23.7	23.7	8.1	31.6	71.1	8.3	52.6
	Median	0.0	0.0	0.0	0.0	100.0	0.0	100.0
	Sign.							

		Business established due to:				
2004 Sample		Potential unemployment of founder (%)	Desire of founder to run own business (%)	Desire to implement new idea (%)	% wishing to grow substantially	% wishing to grow moderately or substantially
Fast and Novel	Mean	16.4	71.2	49.3	72.7	95.5
	Median	0.0	100.0	0.0	100.0	100.0
Other Firm	Mean	26.1	67.5	43.8	27.9	92.6
	Median	0.0	100.0	0.0	0.0	100
	Sign.				**	

Table 3.4 Absorptive capacity – management

1997 Sample		Age	Years with the business	CEO Years as CEO	CEO Science/ Eng degree	CEO Another type of degree/ prof qualification	Founder	Limitations: Management skills (% very significant or crucial)	Barriers to innovation: (% very significant or crucial) Organisational rigidities	No need to innovate due to earlier innovations	Innovation too easy to copy
Fast and Novel	Mean	50.1	16.4	14.7	40.0	36.8	85.0	40.0	10.5	5.6	0.0
	Median	48.0	11.0	10.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	51.4	18.1	12.9	44.2	40.0	54.7	9.8	5.9	6.0	10.2
	Median	51.0	17.0	12.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
	Sign.						**	**			

2004 Sample		Age	Years with the business	CEO Years as CEO	CEO changed	Limitations: Management skills (% very significant or crucial)
Fast and Novel	Mean	51.4	12.9	11.6	0.0	28.4
	Median	49.0	10.0	8.5	0.0	0.0
Other Firm	Mean	53.3	17.6	14.6	15.4	16.1
	Median	53.0	17.0	13.5	0.0	0.0
	Sign.	*	**	**		

Table 3.5 Absorptive capacity – collaboration

			Collaboration with: (% of all firms)			
1997 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Fast and Novel	Mean	65.0	15.0	25.0	15.0	45.0
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	50.0	22.2	27.8	3.7	33.3
	Median	50.0	0.0	0.0	0.0	0.0
	Sign.				*	

			Collaboration with: (% of all firms)			
2004 Sample		Collaborative arrangements in last 3 years (%)	Suppliers	Customers	HEIs	Firms in same line of business
Fast and Novel	Mean	71.6	38.8	37.3	25.4	37.3
	Median	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	64.5	41.9	41.1	27.4	36.3
	Median	100.0	0.0	0.0	0.0	0.0
	Sign.					

Absorptive Capacity – knowledge sources

This information is available only for the 1997 Sample. Table 3.6 shows that fast growth, novel innovators regard their own organizations, customers, suppliers, consultancy firms and a number of other sources (but not HEIs) as more important knowledge sources for innovation than do other firms. However, this difference is only significant for firms within their own group and for consultancy firms.

When we look at information barriers to innovation, the only significant difference is that the fast growth, novel innovators were much more likely to claim that a lack of information on technologies stood in their way.

Barriers – resource constraints

Table 3.7 explores whether we can explain the growth differences by resource constraints. Fast growth firms, novel innovators are experiencing higher constraints on their business objectives in terms of skilled labour. They also point to significantly higher shortages of skilled personnel as barriers to innovation.

Barriers – demand and competition

Fast growth innovators are not significantly different in their dependence on their largest customer, or in the overall degree of competition they face. On the other hand, they do have more difficulty with overseas markets than slow growth firms. In terms of limitations on attaining their business objectives, Table 3.8 shows that the fast growth innovators give a lower weight to the increasing degree of competition than other firms.

Constraints – financial and economic

The findings concerning financial and economic constraints on firm growth are shown in Table 3.9. We find no difference between the groups in their access to finance of either sort. The other financial and economic constraints on achieving their business objectives are generally lower for the fast growth, novel innovators, but the differences are not statistically significant.

Policy Changes sought

There is no evidence in Table 3.10 for the suggestion that fast growth, novel innovators look for a different set of government policy changes, or that the proportion seeking such changes differs, when compared with other firms in the sample.

Table 3.6 Absorptive capacity - knowledge sources

		Sources of information: (% very significant or crucial)							
1997 Sample		Within the firm	Within the group	Suppliers of materials/ components	Clients or customers	Competitors in your line of business	Consultancy firms	Universities/ HEIs	Govmnt/private non-profit research institutes
Fast and Novel	Mean	85.0	66.7	35.0	52.6	22.2	15.8	5.3	11.8
	Median	100.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0
Other Firm	Mean	76.3	0.0	26.3	43.2	10.8	2.6	5.3	7.9
	Median	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.		**				*		

		Sources of information: (% very significant or crucial)					Barriers to innovation: (% very significant or crucial)		
1997 Sample		Patent disclosures	Professional conferences/ journals/meetings	Fairs/ exhibitions	Trade associations, chambers of commerce	Computer based info networks	Lack of information on technologies	Lack of information on markets	Lack of technological opportunities
Fast and Novel	Mean	5.9	16.7	31.6	11.1	10.5	26.3	22.2	10.5
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	0.0	5.4	13.5	2.7	10.8	3.9	25.5	14.3
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.						**		

Table 3.7 Barriers - resource constraints

1997 Sample		Limitations: (% very significant or crucial) Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site	Innovation barrier: Lack of skilled personnel
Fast and Novel	Mean	25.0	45.0	10.0	15.0	10.0	45.0
	Median	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	15.7	27.5	5.9	5.8	7.7	13.7
	Median	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.						**

2004 Sample		Limitations: (% very significant or crucial) Skilled labour	Marketing and sales skills	Acquisition of technology	Difficulties in implementing new technology	Availability of appropriate premises or site
Fast and Novel	Mean	28.4	20.9	25.4	6.0	10.4
	Median	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	16.0	23.4	34.7	4.8	14.5
	Median	0.0	0.0	0.0	0.0	0.0
	Sign.	**				

Table 3.8 Barriers - demand and competition

1997 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Limitations: (% very significant or crucial) Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition	Innovation barrier: Lack of customer responsiveness to innovation
Fast and Novel	Mean	35.0	6.4	50.5	25.0	25.0	15.0	10.5
	Median	0.0	4.0	63.3	0.0	0.0	0.0	0.0
Other Firm	Mean	28.8	10.6	26.7	9.8	31.4	26.0	27.5
	Median	0.0	5.0	5.0	0.0	0.0	0.0	0.0
	Sign.			*				

2004 Sample		% of firms with 25% or more sales to largest customer	No. of serious competitors	% overseas competitors	Limitations: (% very significant or crucial) Access to overseas markets	Overall growth of market demand in principal product markets	Increasing competition
Fast and Novel	Mean	32.3	8.7	50.9	10.4	13.4	20.9
	Median	0.0	5.0	50.0	0.0	0.0	0.0
Other Firm	Mean	24.6	25.4	46.0	4.0	9.7	34.7
	Median	0.0	5.0	41.7	0.0	0.0	0.0
	Sign.				*		**

Table 3.9 Constraints - financial and economic

1997 Sample		Limitation: (% very significant or crucial) Availability and cost of finance for expansion	Availability and cost of overdraft finance	Barrier to innovation: (% very significant or crucial) Excessive perceived risk	Lack of appropriate sources of finance	Innovation costs too high	Pay-off period of innovation too long	Firm's innovation potential too small
Fast and Novel	Mean	10.0	5.0	15.8	10.0	36.8	10.5	42.1
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Firm	Mean	25.0	19.2	30.0	27.5	38.0	29.2	23.5
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sign.							

1997 Sample		Barrier to innovation: (% very significant or crucial) Innovation costs hard to control	Legislation, norms, regulations, standards, taxation	Uncertainty in timing of innovation
Fast and Novel	Mean	33.3	11.1	5.3
	Median	0.0	0.0	0.0
Other Firm	Mean	19.6	16.3	20.4
	Median	0.0	0.0	0.0
	Sign.			

2004 Sample		Limitation: (% very significant or crucial) Availability and cost of finance for expansion	Availability and cost of overdraft finance
Fast and Novel	Mean	28.4	19.4
	Median	0.0	0.0
Other Firm	Mean	28.2	16.1
	Median	0.0	0.0
	Sign.		

Table 3.10 Policy changes

2004 Sample		Tax changes	More support	Less employment legislation	Less red tape
Fast and Novel	Mean	29.9	20.9	14.9	29.9
	Median	0.0	0.0	0.0	0.0
Other Firm	Mean	31.2	28.8	16.0	32.8
	Median	0.0	0.0	0.0	0.0
	Sign.				