Do Small Innovating Firms Outperform Non-Innovators?

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ABSTRACT. The paper considers the relative performance [along a number of parameters] of a sample of 228 small manufacturing firms categorised by level of innovation. Whilst innovators appear no more likely to have experienced some form of sales or employment growth, they are significantly more likely to have grown more. In other words, the innovators' growth rate distributions are highly negatively skewed. With regards to export intensities, profitability and productivity levels, the findings are less clear. On the whole, the results reported here are similar to those of other small firm studies, yet vary markedly from large firm equivalents; suggesting that the nature of the returns to innovation may be contingent, at least in part, upon firm size. Moreover, the high levels of variation in firm performance should caution us against proffering innovative imperatives. If we are to counsel firms to "innovate at all costs", we must be clear about, and clearly demonstrate, the nature of the returns they may reasonably expect and the processes through which these may be optimised.

KEY WORDS: growth, manufacturing, performance, product innovation, small firms

Introduction

In 1992 Paul Geroski and Steve Machin asked 'Do innovating firms outperform non-innovators?' (Geroski and Machin, 1992). Unremarkably, the answer to this rhetorical question was 'yes'. Indeed, the notion that innovation and firm performance are inextricably linked has had considerable influence upon both industrial policy and academic fashion (Oakey, 1995). Specifically, as Geroski and Machin (1992) note, we might anticipate that one of the effects of new product innovation would be a transitory period of increased sales – until such times as the firm loses proprietary control over the new knowledge (or new combination of existing knowledge) employed. Moreover, and perhaps more importantly, the process of research and development (irrespective of formality) is likely to increase the firms external absorptive capacity (Cohen and Levinthal, 1990; Levinthal, 1996) and, relatedly, its internal knowledge base – leading to greater flexibility and adaptability. In the latter case, differences which evolve between innovators and non-innovators are likely to be persistent and their impact independent of the development and launch of specific innovations. As Freeman (1994a) notes "[t]he fastest growing firm are distinguished by their capacity for a flow of incremental innovations as well as (more rarely) outstanding success with a radical innovation" (p. 81). Nevertheless, in both instances, innovation serves to increase profitability and drive organic growth (Geroski and Machin, 1992, pp. 79–81). The private appropriation of such benefits of innovation are [almost] universally believed to be both the incentive and the outcome of the process of innovation (Dosi, 1988). However, this [superficially] uniformly positive view serves to obscure a remarkable degree of empirical equivocation. Whilst, in a very general sense, the most innovative firms are invariably shown to outperform their less innovative peers, this axiom does not appear to hold across all dimensions of corporate performance. Moreover, some studies have suggested that the returns to innovation may be contingent upon firm size (Moore, 1995). In other words, whilst innovators outperform non-innovators, irrespective of firm size, the nature of such superior performance may vary according to firm size.

Taking a lead from Geroski and Machin's original article, the current paper seeks to inves-

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tigate the relative performance of innovative and non-innovative small firms[1] (based upon a sample of 228 small manufacturing firms). To what extent, and upon which parameters, do small innovating[2] firms enjoy superior performance over their less innovative counterparts?

Firm growth and performance

On a general note, Storey (1994) holds that ". . . innovation [is] associated with more rapid growth within small firms" (p. 149) and, more recently, Heunks (1998) found that "[i]nnovation of any kind fosters growth of small firms" (p. 270). However, in addressing the impact of innovation upon firm growth and performance one must first determine the measures to be employed. In their paper, Geroski and Machin (1992) consider the effect of innovation on principally two performance parameters – profitability (the rate of return on sales) and firm growth (the rate of growth in sales). Yet, corporate performance can be measured in any number of ways; ranging from objective measures, such as growth in assets, to subjective assessments based upon the company's [self-reported] position on a given performance index (Delmar, 1997) – each of which may be subject to a variety of interpretations. Notwithstanding the myriad measures, and associated interpretations available, perhaps the most common means of operationalising firm growth are growth in sales turnover and employment growth. These measures are relatively uncontroversial (methodologically) and data tends to be easily available, increasing the scope for cross-study comparability. Accordingly, such measures form the basis of this current study. In addition to those employed by Geroski and Machin, the data allows us to investigate a further eight, relatively objective,[3] measures of firm performance; growth in employment, growth in profits, absolute profit, profit/head, profit margins, productivity levels, productivity growth and export propensity (as both a binary variable and as a proportion of sales turnover).

Sales

Addressing first the impact of innovation on sales growth; as noted above, one of the assumed outcomes of product innovation is a temporary period of increased sales. Through improved product performance and/or reduced cost the firm is able to capture a greater proportion of the available market demand. These benefits are likely to persist insofar as the firm is able to exert property rights or effectively employ other appropriability devices – e.g. learning curve effects, secrecy, first mover advantages, etc. (Dosi, 1998). In the sense that, within the current study, performance measurements relate to only two time periods (1994 and 1996) our interest appears to be with the short term and the impact of these transitory changes upon company performance. However, since innovation is herein defined as the number of new products[4] introduced [1994–1996] as a proportion of the firms product base, and the impact of the launch of any given one product was not explicitly recorded, our concern is also with the more permanent effects upon internal structure, culture and routines which are the result of the *process* of innovation – i.e. being 'intrinsically innovative' rather than 'occasionally innovative' (Geroski and Machin, 1993; Geroski and Machin, 1992).

Turning to empirical precedents for innovation induced sales growth; the evidence is somewhat ambivalent. For instance, Geroski and Machin (1992) record ". . . no permanent or generic differences to be found between innovators and non-innovators" (p. 88), finding only that the rate of growth within non-innovators was more sensitive to changes in the macro-environment. By contrast, a number of studies of small firm innovation (see Roper et al., 1996; Roper, 1997; Wynarczyk and Thwaites, 1997; Moore, 1995; CBR, 1992) point to ". . . a strong positive association between [product] innovation and turnover growth" (Roper, 1997, p. 526). This contrast in the fortunes of large and small firms may reflect the greater scope for increasing market share which exists within much of the small firm sector. It is widely believed that the bulk of small firms see their primary competitors as numerous other small firms occupying the same or adjacent market niches (Storey and Sykes, 1996). In this way, brand loyalty is likely to be relatively weak and the scope for winning market share, at the expensive of competitors, greater. Alternatively, the greater incidence of significant sales growth may be a function of the industries in which the most innovative small

firms operate – i.e. those early stage, fast growth industries (such as biotechnology) which are likely to be marked by a larger proportion of small entrepreneurial firms (Freeman and Soete, 1997; Freeman, 1994b; Rothwell, 1984). However, the industry analysis of the current data is restricted to the two-digit level (SIC(92)), and, on this basis, there is little reason to presume that a significant proportion of the sample firms operate in less mature, more dynamic industries. As such, and for the purposes of this current paper, our hypothesis simply holds that: in the main, innovators are more likely to have enjoyed superior sales growth than their less innovative counterparts.

Employment

Perhaps the most common measure of growth. Nonetheless, there would appear to be little reason to anticipate a direct link between product innovation and employment growth. Indeed, there is some theoretical foundation for holding that product innovation in one firm may lead to reduced employment further along the value chain (where the initial product innovation acts as labour saving process technology) (Hall, 1994) – although, this view is rarely borne out by empirical studies (OECD, 1998). It is more likely that the arrow of causation is indirect, in such a way that growth in employment, if it occurs, derives from increased sales and improved competitiveness (which are likely to be the direct consequences of successful innovation).

Again, turning to empirical precedent; the evidence tends to even greater ambivalence than was the case for sales growth, discussed above. Whilst the small firms literature forms a general consensus, with regards the link between innovation and sales growth, there is little consistency, in the empirical evidence, when the link between innovation and employment growth is considered. On the one hand, Brouwer et al. (1993) note ". . . a significant positive impact [of product innovation] on employment growth" (p. 157) (with this view finding support in, *inter alia*; Moore, 1995; Westhead and Cowling, 1995; Cesaratto and Stirati, 1996; Tether and Massini, 1998). However, yet more authors have suggested that ". . . at the micro-level innovative activity does not appear to be positively related to job creation" (Kalantaridis and Pheby, 1999, p. 75 – see also; Wynarczyk and Thwaites, 1997; Roper, 1997; Oakey, 1991). The explanation for this remarkable tension within the empirical literature is unlikely to be easily identifiable and may relate, in part, to methodological idiosyncrasies (such as the definition of innovation employed). Nonetheless, a compelling rationalisation is provided by Tether (1997). In highlighting the danger of viewing innovative firms ". . . as a 'virtual panacea' for Britain's economic rejuvenation" (Tether, 1997, p. 91), Tether points to generally modest mean rates of direct employment creation and distributions which are invariably highly skewed. To rephrase, when treated as a single population, innovative small firms appear to outperform non-innovators in terms of job creation, if only modestly so. Yet, on closer examination, there is considerable variation in the employment generating activities of these firms and, as has been noted for the small firm sector generally (Storey, 1994), the bulk of jobs are likely to have been created by a small sub-set of the total population. Accordingly, our hypothesis holds that, as a group, innovators are likely to enjoy superior employment growth than non-innovators, but that the bulk of this differential will be as a result of the exceptional job creation activities of a few such firms.

Profits and profitability

Due to disincentives to profit retention (particularly within non-listed companies), growth in profits or absolute profit levels are rarely measured in studies of corporate performance. Nonetheless, all other things being equal, we might presume that the increased sales, reduced costs and improved competitiveness which are the consequence of innovation (and being innovative) will lead inevitably to higher profits. Indeed, Geroski and Machin (1992) note relatively large and persistent differences in the profits of innovators and non-innovators; wherein innovators capture significantly higher profits than their non-innovating counterparts (only a small proportion of which is due to greater market shares). However, work in the small firm sector has tended to suggest that innovation may in fact be associated (at least in the short-term) with lower profits – i.e. ". . . innovation tends to result in growth and

efficiency, but not immediately in more profits" (Heunks, 1998, p. 266). Low profits may be the cost of innovative investment – the sunk costs (see Symeonidis, 1996) – or they may be the stimuli to innovation. Moreover, the success of a given innovation is not likely to be manifest in increased profits until some years after product launch, and then only for occasional innovators and not intrinsic innovators, in whom innovative investment may be perennial and the anticipated returns longer-term still. Either way, we would anticipate that the cross-sectional relationship between innovation and profits is negative. However, the empirical literature again fails to find consensus; Wynarczyk and Thwaites (1997), for example, find that ". . . innovative firms appear, on average, to have relatively higher retained profits" (p. 184) (see also Wynarzyk and Thwaites, 1996).

The issue of profitability, as measured by profit margins, is somewhat different from the discussion above. This measure provided Geroski and Machin (1992) with their most robust finding; such that the margins captured by the most innovative firms were significantly, and persistently, larger than those of their less innovative peers. In this way profit margins may be considered as a measure of improved internal efficiency and value added. Whilst, due to the requirement to repay initial investments or fund further investment, small innovators may not enjoy higher net profits, it is conceivable that both the process and the product of innovation will allow them to capture higher margins than their peers. To rephrase, internal efficiency gains may lead to reduced costs, whilst simultaneously, improved product performance may increase the price the market is willingness to pay. Again, however, there is tension in the empirical literature – Moore (1995), for example, finds "no clear relationship between . . . innovation and profitability" (p. 24).

In light of the foregoing, the following hypotheses tentatively suggest themselves: i. small innovators are likely to enjoy slower growth in profits and lower levels of absolute profit, than are their less innovative counterparts; however, ii. small innovators are likely to enjoy higher average profit margins (profits as a proportion of sales turnover).

Productivity

Related to the above discussion of profit margins, relative productivity (measured as sales turnover per Full-Time-Employee (FTE)), may be used as a measure of internal efficiency, general competitiveness and, further, as an imperfect measure of value added. Whilst we may, more obviously, associate productivity growth, or higher productivity levels, with cost reducing process innovation (indeed, at the firm level, there is considerable empirical evidence to support this technology-productivity relationship; see OECD, 1998), the current interest is with the link between innovativeness, or innovative effort generally, and productivity. In this vein, increases in absorptive capacity (discussed earlier) and associated increases in the firm's knowledge base, which result from being 'innovative', are likely to lead to higher productivity levels and productivity growth than would otherwise have been the case.

Using R&D intensity as a measure of innovativeness (and a proxy for the development of absorptive capacity – see Cohen and Levinthal, 1989), with an explicit interest in the qualitative differences between innovators and non-innovators, Wakelin (1997) finds evidence of ". . . a positive role for R&D expenditure in productivity growth". However, two caveats are noted for this research; firstly, the nature of the relationship is not clear at the firm level, with a number of sector variables significantly impacting upon the findings; secondly, Wakelin's sample consists of 170 large, quoted manufacturing firms, and the issue of firm size is central to the current paper. For small firms (<200 employees), Cesaratto and Stirati (1996), using a sample of Italian manufacturing firms, find a similar positive relationship between innovation and productivity – recording per capita productivity increases for innovators and non-innovators, over the period 1990–1992, of 3.86% and 2.56% respectively. Accordingly, and notwithstanding the concerns noted, the weight of evidence and intuitive logic would tend to suggest that there will be some positive relationship between product innovation, as an indicator of general innovativeness, and absolute productivity levels and between product innovation and productivity growth (see also Griliches, 1995).[5] Accordingly, this forms the basis of our

hypothesis – though this is not to imply a consensus in the small firms literature (cf. Heunks, 1998).

Exporting and export intensity

The final performance measure to be considered is that of exporting. As noted earlier, this can be measured either as a simple binary variable (i.e. does the firm export or not?) or as a measure of export intensity (the proportion of sales turnover derived from exporting). In this way, one is able to answer two questions; i. are innovators more likely to export? and, ii. are innovators likely to export more?

Theoretically, there exists a fairly clear positive relationship between value added, uniqueness of product and export propensity. In practice, however, the link is less easily established. Cesaratto and Stirati (1996), for instance, note only a marginal difference between share of exports on sales in small innovators and non-innovators (24% and 21%), although the authors do note a significantly higher rate of growth in exporting in innovators over the period 1990–1992 (9.27% as opposed to 4.25% in non-innovators).[6] Moreover, Wynarczyk and Thwaites (1997) report ". . . evidence of high involvement with, and growth of, exports in the innovative small firm sector" (p. 178), whilst Moore (1995) finds a positive relationship between innovative activity in new products and export performance. However, by contrast, work by Lefebvre et al. (1998) on the relationship between R&D (as a measure of innovativeness) and export performance was unable to establish any relationship between the two variables (see also Sriram et al., 1989). Yet, despite the frequently contradictory results, the bulk of the evidence, at least for the small firms sector, points to a greater likelihood to export and to export more on the part of the most innovative firms. This, again, forms the basis of the current hypothesis.

The sample

The present study is based in the West Midlands region of England which possesses a relatively large, if declining, manufacturing base (manufacturing firms within the region contribute 30.06% of GDP compared to the UK average figure of 21.75%). In addition, manufacturing productivity levels in the West Midlands (measured as GDP per head) are 6.2% lower than the UK average.[7] Moreover, compared with the UK as a whole, the West Midlands has a larger tail of under-performing firms, and a smaller proportion of firms with very high performance (Gibbons and Kelly, 1997). This would seem to suggest that firms within the region are generally less innovative than their extra regional peers. A caveat to this would be to note that '. . . the industrial distribution of manufacturing activity [within the region] is skewed towards low productivity sectors and sectors with low R&D intensity' (Oughton and De Propris, 1997, p. 49). Accordingly, we might anticipate that certain aspects of the region's innovative potential would be constrained. Nonetheless, some evidence exists to suggest that other regional innovation systems have prospered by introducing new technology and design expertise to traditionally low technology industries (Oughton and De Propris, 1997). Indeed, of the G7 economies, only Japan's competitive advantage in exports relies on high-technology goods. In Germany and Italy, for example, comparative advantage lies in medium technology and low-medium technology sectors respectively.

Specifically, the sample consists of 228 manufacturing SMEs (<250 Full-Time-Employees) who provided useable responses to a comprehensive postal questionnaire addressing innovation and general organisational characteristics. The questionnaire asks, relatively detailed, questions relating to internal skills and organisation, sources of finance, sources of information, and collaboration. The current paper is concerned primarily with the firms' responses to a series of questions relating to organisational performance and characteristics. With regards the make-up of the sample: Manufacturing is defined at the two-digit SIC(92) level. A large proportion of the sample firms are independent (80%) and have fewer than 21 full-time employees (52.2%). Of those responding, 72.2% reported introducing a new product in the financial period 1994–1996, and 70.2% of firms recorded an intention to innovate within the next 12 months.

To dichotomise between innovators and non-innovators, for the purposes of comparison, inno-

vation has been defined using a 'rate of innovation' measure. It is often convenient to adopt an absolute definition of innovation such as 'new product introduction' (see Cosh et al., 1996). However, this ignores the relativity of best practice. As noted above, 72.2% of the sample firms report introducing a new product in the given time period. Yet, it is likely that many of these firms are not truly 'innovative'. It seems more appropriate to consider firms as 'more innovative' and 'less innovative', allowing us to benchmark against best practice. The rate of innovation definition is based upon the number of new products introduced as a proportion of the firm's product base. To illustrate, all other things being equal, the firm which has produced 500 products in the given time period, of which 9 are newly introduced, is *likely* to be less innovative than the firm which has produced 50 products, of which 35 are newly introduced. Accordingly, a rate of 0.2 or greater has been used to differentiate the 'innovators' from the 'non-innovators' (i.e. at least 1/5 of the firm's product base consists of newly introduced products). Applying this rule divides the sample into 99 'Innovators' and 129 'Non-Innovators'. The decision as to where to place the point of separation is admittedly arbitrary. Given the contention that innovation is not categorical but a matter of degree, and therefore occurs along a continuum, this is somewhat unavoidable. However, adopting a similar definition, Goffin (1998) notes that the upper quartile innovation rate for firms in the UK electronics industry was 18.7% (p. 11). Accepting that electronics is a relatively (though not necessarily highly) innovative sector, it appears reasonable, in separating the most innovative from the least innovative, to place our classification point thereabouts. In the interests of circumspection, it is important to note the potential for response bias associated with this operational definition of innovation. The number of new products introduced and the size of a given firm's product base were self reported. To that end, there is necessarily a degree of subjectivity (notwithstanding attempts to explicitly define 'new products') and the potential for over-reporting. However, such biases are intrinsic to remotely administered survey research and, whilst it is important to be aware of the possible effects, there are no *a priori* reasons for considering them to be substantial. Moreover, the almagamation of two independent questions and the use of a relative definition of innovation should ameliorate – if not eliminate – the weakness.

Though not discussed in the previous section, observed differences in either profits, profit margins or productivity may simply reflect sectoral differences between innovators and non-innovators (and the intrinsic differences in these variables between sectors) – since it is known that both the rate and nature of innovation various considerably across industries (Pavitt, 1984). Alternatively, they may also reflect independent differences in relative firm size and/or competitiveness. Such biases are inevitable in cross-sectional research of this type. However, examining the relative growth rates of some variables allows one to reduce, somewhat, this type of bias. As Griliches (1995) notes, in this context, ". . . considering growth rates is equivalent to doing a 'within' firms analysis, one that eliminates the influence of such fixed effects" (p. 58).

Notwithstanding the inclusion of growth measures in the analysis, it is worth commenting upon the size and sectoral distributions of the innovators and non-innovators sampled. Table I details the relative size (both in employment and sales revenue) and the sectoral distribution of the innovator and non-innovators sub-samples.

The evidence presented suggests that sample innovators are likely to be smaller than their less innovative counterparts (statistically significantly so, in the case of employment). Accordingly, we might anticipate, *ceteris paribus*, a tendency towards higher per capita productivity and lower absolute profits. However, the influence on productivity is not likely to be great and, moreover, the inclusion of growth rate variables should sufficiently ameliorate these weaknesses.

Turning to sectoral differences between innovators and non-innovators; here, the most obvious distinction is in the number of firms classified as Metal Fabricators (10.1% of innovators and 21.7% of non-innovators). It is believed that innovative effort within this sector, styled 'production and scale intensive' by Pavitt (1984), is primarily focused on cost reduction through process improvement. Therefore, it is hardly surprising that a classification based upon product innovation should find a disproportionately large

TABLE I
Size & sectoral distribution of innovators and non-innovators

	Innovators (n = 99)		Non-Innov (n = 129)			
	Mean	Median	Mean	Median	z	p*
Employment (FTEs)	30.68	20	44.71	23	2.3	0.02
Turnover (£000's)	1987	900	2537	1208	1.3	0.19
Sector	Innovators (n = 99)		Non-Innovators (n = 129)			
Food products and beverages (15)	11	11.1%	8	6.2%		
Textiles (17)	2	2.0%	6	4.7%		
Wearing apparel (18)	4	4.0%	5	3.9%		
Chemicals (24)	6	6.1%	5	3.9%		
Rubber and plastics (25)	12	12.1%	19	14.7%		
Other non-metalic mineral prod. (26)	8	8.1%	9	7.0%		
Fabricated metal products (28)	10	10.1%	28	21.7%		
Machinery and equip. (nec) (29)	14	14.1%	22	17.1%		
Electrical machinery (31)	10	10.1%	6	4.7%		
Radio, TV and comm. equip. (32)	3	3.0%	2	1.6%		
Medical and precision equip. (33)	6	6.1%	11	8.5%		
Motor vehicles and trailers (34)	8	8.1%	6	4.7%		
Other transport equip. (35)	5	5.1%	2	1.6%		

The numbers in parenthesis in column 1 refer to the appropriate two-digit SIC(92) code.
* Based on Mann-Whitney U-Tests.

number of such firms classed as non-innovators. Notwithstanding this, there is little *a priori* reason for inferring a negative impact upon productivity. Indeed, it may plausibly be argued that an explicit focus on process innovation will lead to more immediate and greater returns in the form of productivity increases than would a, more tangential, product innovation focus. However, there is some evidence to suggest that this sector is inherently lower value added (Oughton and De Propris, 1997), leading to correspondingly lower profit margins. Despite these concerns the differences in sectoral distributions are relatively slight[8] and there is little reason to believe that the observed differences will bear heavily on the final results.

Analysis and discussion

The purpose of this section is to revisit the earlier discussion, and the tentative hypotheses derived, with reference to the data generated by the current sample. To this end, Table II contains the bulk of evidence referred to throughout.

Sales turnover

As noted, the small firms literature reaches comparative consensus regarding a fairly direct causal link between product innovation and increasing sales turnover – product uniqueness or improved functionality allowing scope for increased market share at the expense of competitors (see Roper et al., 1996; Roper, 1997; Wynarczyk and Thwaites, 1997; Moore, 1995; CBR, 1992). To this end, the current data set provides further corroboratory evidence – although perhaps less emphatically so. The results of a Mann-Whitney U test (Table II), find a positive relationship between product innovation and sales growth (p = 0.06). This finding stands in contrast to Geroski and Machin's (1992) large firm study, in which they recorded no substantive differences in the growth rates of innovators and non-innovators. Whilst it may be possible to speculate on the reasons for such disparate observations (e.g. less obvious opportunity for increasing market share in large firms – especially when measured as a rate of change – and greater emphasis on process improvement and cost reduction), in the absence of a more sophisticated sectoral analysis, or greater detail on the

TABLE II
Innovation and performance relationships

	Innovators			Non-Innovators			
	n	mean	median	*n*	mean	median	*z**
Growth in T/O (%)	87	0.7118	0.2755	107	0.3683	0.2000	1.891
Growth in FTEs (%)	94	0.2922	0.2071	123	0.1964	0.0526	3.125
Growth in π (%)	57	0.8758	0.5000	60	0.7980	0.0942	0.998
π per head (£000s)	60	7.487	3.875	69	4.587	2.570	1.983
π Margin (%)	60	0.1138	0.0792	67	0.0892	0.0619	0.659
Absolute π (£000s)	60	112.1	54	69	186.2	90	1.890
Productivity (£000s)	91	73.78	58.23	108	61.40	48.05	1.754
Productivity Growth (%)	87	0.0615	0.0649	102	0.0905	0.1	1.081
Export Intensity (%)	85	21.65	10.00	97	16.77	5.00	1.337

* Normal approximation, based upon Mann-Whitney U Test.

operations of individual firms, it is difficult to form any robust conclusions. Notwithstanding this caveat, the data finds in favour of the stated hypothesis. That is, innovative firms appear to enjoy greater sales growth than do their less innovative counterparts.

In addition to supporting the general hypothesis regarding innovation induced superior sales growth, the data in Table II raises a further issue for consideration. As the data illustrates, for both innovators and non-innovators, the mean rate of sales growth considerably exceeds that of the median. In other words, the distributions of sales growth appear to be skewed (markedly so in the case of innovators). This is in line with the observations made by Tether (1997) regarding employment growth (discussed earlier) and, additionally, appears to hold true for both growth in employment and profits (discussed more fully below). The issue is more clearly illustrated through classification of the sub-sample firms as either 'Declining', 'Stable', 'Growth' or Super-Growth' (defined as those firms who have grown as least as fast as the all-sample upper quartile growth rate of 0.5).[9] The data (Table III) suggests that, whilst there is little difference in the proportions of firms, by innovative classification, enjoying some form of sales growth (77% of innovators and 79.4% of non-innovators), there exists a disproportionate number of innovators in the 'Super-Growth' category (36.5% of innovators compared to 19.6% of non-innovators). Figure 1 presents this finding graphically and, based upon a chi-square independence test, the observed differences are statistically significant ($p = 0.02$).

To summarise, innovators appear no more likely than non-innovators to have enjoyed growing sales revenue over the period studied. However, where some sales growth was experienced, it is likely to have been greatest within the innovative firms. As a final caveat, it is worth noting that innovators do not appear to have experienced greater absolute increases in sales turnover between 1994 and 1996. However, whilst innovators and non-innovators recorded arithmetic mean increases in sales turnover of £355,035 and £423,860 respectively, this observed difference was not statistically significant (again, based upon a Mann-Whitney U test; $p = 0.97$).

TABLE III
Growth in turnover

	Declining	Stable	Growth	Super-Growth	*n*	df	χ^{2*}
Innovators	13	7	36	31	87	3	9.43
Non-innovators	18	4	64	21	107		

* Chi-square statistic significant at 5%.

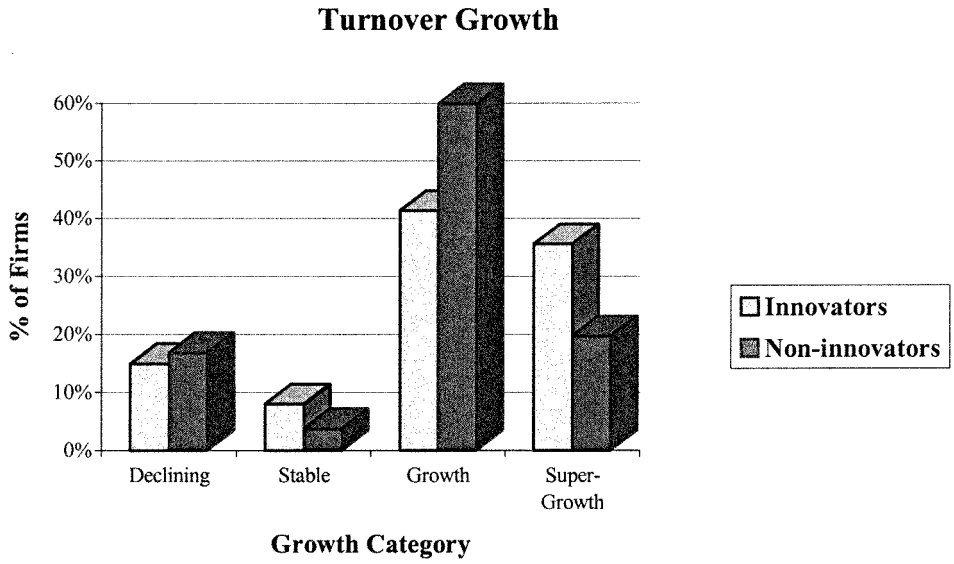

Figure 1.

Employment

The earlier sections of this paper remarked upon the tendency for empirical studies, investigating the relationship between innovation and employment growth in small firms, to be marked by ambivalence, when viewed as a whole. This is in contrast to the fairly universal evidence linking small firm innovation and sales growth (discussed above), to which this paper contributes. Yet, in the current study the innovation-employment link provides the most emphatic and positive finding. Again, referring to Table II, the results of a Mann-Whitney U test point to a statistically significant positive relationship between product innovation and employment growth ($p < 0.01$). Accordingly, the data once more provides support for the primary hypothesis – i.e. innovators appear to enjoy superior employment growth than non-innovators. However, as was the case with sales revenue, median and mean growth rate data suggest considerably skewed distributions; in line with Tether's (1997) observations.

By classifying the firms in a similar manner to that adopted for sales revenue above (in this instance, the upper quartile growth rate is 0.33), Table IV and Figure 2 clearly illustrate the superior growth performance of the sample innovators. In this instance, innovators appear considerably more likely than non-innovators to have experienced some form of employment growth (69.1% versus 56.1%). Moreover, this observed difference is magnified when considering only those firms who enjoyed 'Super Growth' (39.4% and 19% of innovators and non-innovators, respectively). Tentatively, the stated hypothesis is supported. That is, over the period, sample innovators experienced greater growth in employment than non-innovators. Yet much of this observed difference is derived from the exceptional perfor-

TABLE IV
Growth in employment

	Declining	Stable	Growth	Super-Growth	*n*	df	χ^{2*}
Innovators	12	18	27	37	94	3	12.60
Non-innovators	19	35	47	22	123		

* Chi-square statistic significant at 1%.

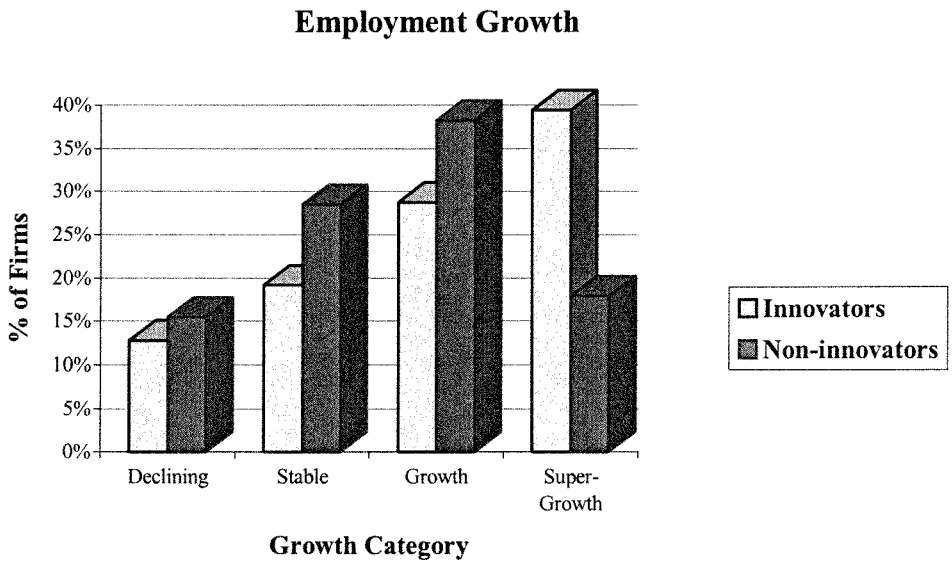

Figure 2.

mance of an, admittedly large, group of innovators enjoying significant growth (e.g. of the 14 firms who experienced growth rates in excess of 0.75, 10 were innovators).

As a final comment on employment growth; it may be argued that given the smaller mean size of innovators relative to non-innovators, we might anticipate that, all other things being equal, innovators would inevitably record higher rates of growth than their less innovative peers. In response, it is worth noting changes in absolute employment, such that innovators experienced mean net employment gains of 3.73 FTEs compared to 3.16 FTEs in non-innovators. To restate, innovators outperformed non-innovators both in terms of absolute employment gain and in rates of employment growth.

Profits and profitability

In contrast to Geroski and Machin's (1992) large firm findings, the earlier discussion postulated that the requirement for front end, pre-sales investment, associated with product innovation, would result in a negative cross-sectional relationship between innovation and growth in profits. Moreover, this relationship should hold equally well for the relationship between innovation and levels of absolute profit – especially within those firms who were intrinsically and continuously innovative.

The data in Table II does not allow one to either emphatically endorse or summarily reject the stated hypotheses. Whilst it appears that innovators are significantly more likely to record lower levels of absolute profit than non-innovators (p = 0.06), this may simply be a function of smaller size. Indeed, when size is adjusted for (by investigating profit per FTE), innovators appear to outperform non-innovators (p = 0.05). Sample innovators report a mean profit/FTE of £7,487 compared with £4,587 for non-innovators. Quite clearly, there is no evidence of the most innovative firms experiencing inferior profit performance. In addition, there is no evidence of inferior profit growth performance. Indeed, superficially, innovators appear to have enjoyed superior growth in profits over the period (i.e. a mean growth rate of 0.876 for innovators compared to 0.798 for non-innovators). However, this finding is not statistically significant (p = 0.32).

If the data is, once again, categorised as 'Declining', 'Stable', 'Growth' and 'Super-Growth' (in this instance, 'Super-Growth' is defined as > 1.02), the marginality, of observed differences in profit growth between innovators and non-innovators, is clearly illustrated (see Table V and Figure 3). Unsurprisingly, questions

TABLE V
Growth in profit

	Declining	Stable	Growth	Super-Growth	*n*	df	χ^2
Innovators	17	2	23	15	57	3	1.03
Non-innovators	23	2	20	15	60		

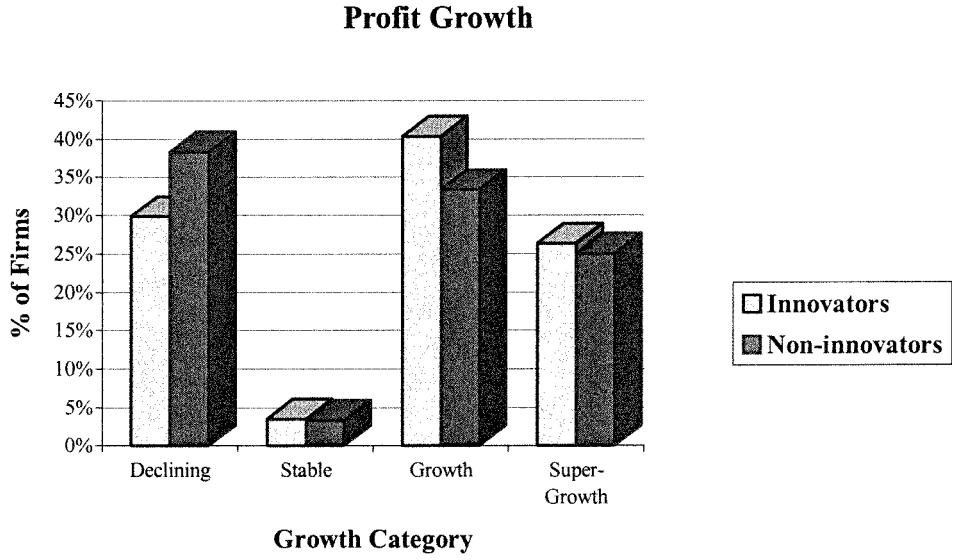

Figure 3.

relating to company profit are marked by a disappointing response rate. Accordingly, any commentary is tentative at best, and any results, less robust than one might hope. Nonetheless, the results of the original Mann-Whitney U Test and the subsequent chi-square test of the categorised data (p = 0.79) provide no evidence of poorer growth in profits being experienced by innovators. Moreover, whilst innovators do appear to have experienced lower levels of absolute profit, this may be explained by their smaller size. Once size has been controlled for, innovators outperform non-innovators.

Turning to profit margins, the earlier discussion anticipated that, for a variety of reasons, innovators would be able to capture higher margins than their less innovative peers. Further, with sample innovators reporting a mean profit margin of 11.4%, compared to 8.9% for non-innovators (see Table II), it is tempting to suggest that the data supports the stated hypothesis. Unfortunately, the finding is not significant (p = 0.51) and there is little evidence that margins vary by innovative classification. This contrasts with Geroski and Machin's (1993) key finding, yet corroborates previous small firms studies (see for example Moore, 1995). It may be that large firms are involved in a greater degree of simultaneous process innovation than their smaller counterparts, and that the associated cost reductions partly explain the divergent results. Indeed, there is some basis for believing that large firms place a sharper focus on cost-reducing process innovation (see Rothwell, 1983, 1984 and 1987). However, in the absence of *ad hoc* data, addressing this issue, any conclusions are primarily conjecture.

Productivity

Simply put, the earlier discussion postulated that innovativeness, proxied by higher rates of new product introduction, would be associated with higher productivity levels and higher rates of productivity growth. To this end, the data pre-

sented in Table II provides limited substantiating evidence. Though innovative firms appear to enjoy both higher mean and median productivity levels and rates of productivity growth, only the former finding is significant (p = 0.08 and p = 0.28, respectively) and then, only marginally so. Any support for the earlier stated hypothesis is tentative at best.

Exporting and export intensity

Finally, the foregoing sections anticipated that, due to issues associated with higher value added, product uniqueness and improved competitiveness, sample innovators would be more likely to export, and to export more, than their less innovative peers. Addressing, initially, export as a simple binary variable; the data presented in Table VI provides no evidence that innovators are any more or less likely to have exported (based upon a chi-square independence test, p = 0.79) – 72.9% of responding innovators reported some level of export activity, as compared with 71.1% of non-innovators.

This is not to suggest that there is no difference between the export performance of the most and least innovative firms. It is conceivable that at least some of those firms classed as exporters achieved very few, incidental, overseas sale during the time period. Accordingly, consideration of export intensity (i.e. the proportion of sales turnover derived from exports) should provide a clearer picture. To that end, Table II provides some tentative evidence in support of the favoured hypothesis. Innovators reported higher mean and median export intensities than non-innovators (21.65% and 10%; 16.77% and 5%, respectively). Unfortunately, the observed differences are not statistically significant (p = 0.18) and it would take an unjustified leap of faith to hold the preferred hypothesis 'proven'.

Concluding remarks and implications

In a recent review of the literature on small firm innovation, Hoffman et al. (1998) note that; ". . . the mixture of available research results suggests that though innovative effort appears to be widespread [within the small firm sector], this does not translate directly into improved firm performance and, ultimately, greater profitability" (p. 44). This runs counter to the *a priori* supposition which formed the basis of our initial discussions. Whilst some doubt was expressed over the nature of improved performance, and indeed the impact of firm size upon the parameters of firm performance, a positive link between innovative effort and firm performance was nonetheless considered axiomatic. In a very general sense, the empirical evidence presented here supports this view. As with Geroski and Machin (1992), the answer to the rhetorical question put by the paper's title is 'yes'. Sample innovators do appear to have experienced superior performance when compared with their less innovative peers – in some parameters, if not all. Accordingly, it is the function of this final section to recap, briefly, the principal observed differences in firm performance. Moreover, where findings differ from those which might have been anticipated, some commentary is offered.

Firm growth

Employing sales turnover as the basis for measuring firm growth, Geroski and Machin (1992) found little difference between the observed performance of large innovators and non-innovators. By contrast, the small firm literature tends towards the opposite finding. Whilst there is some equivocation concerning the impact of innovation upon growth in employment, a relative consensus points to superior sales growth as a characteristic of the most innovative firms (see earlier discussions). To the extent to that the current data points to inno-

TABLE VI
Exporting

	Exporter	Non-Exporter	n	df	χ^2
Innovators	62	23	85	1	0.07
Non-innovators	69	28	97		

vators experiencing statistically higher rates of sales and employment growth, the evidence presented accords with the bulk of the small firms literature surveyed. However, ". . . one would expect a successful innovation to have had a much greater impact on a small firm's growth rate than on a large firm's" (Mansfield, 1962, p. 1036; tense changed). Measuring rates of change rather than absolute changes, whilst preferable, will tend to overstate the contributions of the smallest firms. Indeed, the evidence presented suggests that the current innovators are significantly smaller than their non-innovative counterparts. Yet, this smaller size may not be sufficient to explain the observed differences in growth rates. In the case of employment, innovators also experienced higher absolute growth in FTEs. Though a similar finding was not recorded for absolute increases in sales turnover, adjustment for size (i.e. sales per employee – the measure of productivity used) provides tentative evidence of innovation induced superior performance. To restate, the data suggests, fairly emphatically, that innovators are likely to grow more than non-innovators (although this statement does not apply to growth in profits – see below). Moreover; note that it is held that 'innovators are likely to grow more' and not that 'innovators are more likely to grow'. There is an apparent negative skew in the distribution of firm growth rates, which is considerably more marked for innovative firms. In other words, innovators account for a larger proportion of those firms which may be termed 'Super Growth' and a smaller proportion of 'Declining' firms.

Firm performance

Turning to non-growth related measures of firm performance: Whilst acknowledging measurement deficiencies, the earlier discussion anticipated that innovators would perform relatively poorly with respect to absolute profit levels. The requirement to invest sunk costs, which are independent of the returns to innovation, and fund product development and market diffusion activities (which some estimates place at ten to twenty times initial R&D costs; see Standeven, 1993) may be such that there is an inevitable negative impact on retained profits. Moreover, for those firms who are intrinsically innovative, differences in profits would be persistent and manifest in slower rates of profit growth. Though running counter to previous studies of large firm innovation, the weight of small firm evidence tends to support this position.

Unfortunately, the evidence presented in the current paper does not provide unequivocal corroboration. Whilst innovators report significantly lower levels of absolute profits, this again may simply be a function of smaller mean size. Indeed, figures for profit/head suggest that innovators significantly outperform non-innovators. Moreover, with regards rate of profit growth, there are no statistically significant differences between innovators and non-innovators. Any observed differences in profit growth appear marginal, at best. This latter contention appears to hold for differences in profit margins. Although, superficially, innovators appear to experience higher profit margins than their less innovative counterparts, the finding is not significant. Disappointingly, the relationship between innovative effort and profits, in the current sample, is somewhat ambiguous. This, combined with relatively low response rates to profit related questions, makes it difficult to form any robust conclusions.

The final measure of relative firm performance considered was export performance. Here the expectation was that innovators, who would, *ceteris paribus* and by implication, add greater value to their end products, would also be more likely to export and to export more than non-innovators. Again, however, the evidence is inconclusive. When exporting is treated as a simple binary variable, the data provides no evidence that innovators were more likely to be exporters than were non-innovators. In addition, whilst superficial consideration of export intensities points to the most innovative firms exporting a greater proportion of sales than the least innovative, this finding is not significant. Any support for the stated hypothesis is tentative at best.

In conclusion, and in contrast to the findings of Geroski and Machin's (1992) large firm study, it appear that small innovating firms are marked by higher rates of growth than small non-innovators. However, it is less clear whether innovative effort, in the small firm, is associated with superior profit or export performance. What does seem remarkable, from the evidence of this and other studies, is that the returns to innovation are, at

least in part, contingent upon the size of the firm. Accordingly, imperatives such as Freeman and Soete's ". . . not to innovate is to die" (Freeman and Soete, 1997, p. 266), may be a touch hasty. Whilst we may note that, on aggregate, small innovators grow faster than non-innovators (or large innovators enjoy superior profitability over their non-innovating peers), this is not to suggest that innovation is a necessary, nor less a sufficient, condition for growth or superior performance (as evidenced by the few 'non-innovators' in the current sample who reported 'super-growth' in turnover, employment or profits). Such a position would unreasonably neglect ". . . the enormous variety of circumstances, of modes of learning, of management and entrepreneurial ability and of marketing and technical uncertainties" (Freeman, 1994a, pp. 83–84). Notwithstanding a belief in aggregate innovation as an absolute good, if we are to counsel individual firms to innovate 'at all costs', we must be clear about, and clearly demonstrate, the nature of the returns they may reasonably expect and the processes through which these can be optimised.

Following on from the above, it is appropriate to insert a final codicil. In common with the bulk of similarly motivated studies, the current paper has created an innovator/non-innovator dichotomy. However, this may be overly simplistic. Recent literature concerning the impact of innovation on entry and exit rates (see for example Audretsch, 1995) suggests that (at the risk of oversimplifying) firms whose efforts at innovation fail are more likely to perform poorly than those that make no attempt to innovate. To restate, it may be more appropriate to consider three innovation derived sub-classifications – i.e. 'tried and succeeded', 'tried and failed' and 'not tried' – rather than two. This weakness may serve to over-state the observed performance differential between innovative small firms and genuine non-innovators (i.e. those firms attempting no innovation), leading to the conclusion that firms not attempting to innovate are making an unwise choice – in other words, reinforcing Freeman's imperative. This is patently an erroneous position and, as noted above, the issue is considerably more complex.[10] Regrettably, the data generated for the current study does not allow the investigation of this issue, though it clearly warrants further research.

Acknowledgements

The survey, part of which is reported here, is one component of a larger project developing a regional innovation strategy (RIS) for the West Midlands. Accordingly, I am grateful to the individuals and institutions who have been involved in the West Midland's RIS. In addition, I am grateful to the editor and reviewers for comments on an earlier draft. Nonetheless, any errors in analysis or interpretation remain my own.

Notes

[1] Unfortunately, it is not possible to replicate the Geroski and Machin paper with respect to the impact of changes in the macro environment. The data available only allows a comparative static analysis of a variety of performance parameters at two time periods (1994 and 1996).

[2] The current concern is solely with product innovation.

[3] The degree of objectivity is relative since turnover, profit and employment levels are self-reported.

[4] New products were defined as "those which are new to the company and represent a significant addition to the product portfolio".

[5] Again, however, innovation is proxied by R&D spend precluding direct comparisons with the current study.

[6] Unfortunately, the data available in the current study does not allow the investigation of relative export growth.

[7] Source for data: ONS, Regional Trends, July 1998. The regional economic context of this paper necessarily implies a degree of idiosyncrasy. For instance, the region's declining manufacturing base may reflect the loss of competitive advantage within non-innovative manufacturing which, in turn, may largely explain any observed performance differentials. In regions which have not witnessed such decline results may differ. However, it would be true to say that, for a number of reasons, this trend has marked the developed world (at least at the level of the national economy) for over twenty years. In this sense, whilst generalisability is not perfect, the experience of the West Midlands is likely to resonate with a number of other regional economies.

[8] Based upon a Spearman's rank correlation test there is no statistical difference in the sector rankings (by number of firms in each sector) between innovators and non-innovators – r_s = 0.7330 (adjusted for ties), critical value (α = 0.01) = 0.712; t approx. = 3.574.

[9] For all parameters this categorisation is as follows: Declining firms are those who have experienced some form of contraction (reported growth < 0); stable firms are those who have neither contracted nor grown (reported growth = 0); growth firms are those firms who have experienced some order of increase in the given parameter, excluding super-growth firms (reported growth > 0); finally, super-growth firms are those who have enjoyed growth in the given parameter at least as high as the all sample upper quartile growth rate. In this way, super-growth firms are defined relatively rather than absolutely.

[10] I am grateful to a reviewer for raising this point and to David Audretsch for clarification.

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