Chapter 1

INNOVATION AND GROWTH IN THE CITY REGION: MICROECONOMIC EVIDENCE OF ASYMMETRIES

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Using a micro-economic perspective, this study explores the type, scale and impact of innovation activities that small and medium-sized enterprises (SMEs) undertake with focus on the sub-national level. Based on a representative sample of 250 independent SMEs, based in the Leeds City Region (LCR) and using quantitative methods, this study provides evidence of the types of innovation that are most likely to result in achieving policy aims associated with for example the development of international markets or growth of employment opportunities. The findings show that there is a need for aligning business support for innovation with human capital (education/training) interventions. Furthermore, the findings provide a strong evidence base, at the local level, to inform the development of innovation policy and illustrate the connections between different types of innovation SMEs' growth at regional level.

Keywords: Innovation; growth; region; microeconomics.

Introduction

Small and Medium Enterprises (SMEs) are regarded as the preferred vehicle for the regeneration and development of economies (Gavron *et al.*, 1998; Carr *et al.*, 2000; Beaver and Carr, 2002; Stanworth and Gray, 1991) and for the enhancement of a country's competitiveness (Dobbs and Hamilton, 2007). Specifically,

they are considered essential for the establishment of a solid industrial base and innovation that facilitates industrialisation (Dickson and Weaver, 2008; Smallbone et al., 2010; Arando et al., 2009; Harris and Gibson, 2006; Sauser, 2005; Tonge et al., 2000; Robbins et al., 2000). Notably, they play a vital role in the economy and society not just because performance affects a large degree of the country's economic growth but due to the large number of people they employ and jobs created (Aziz and Mahmood, 2011; Ahmad and Xavier, 2012). In addition to SMEs, innovation is frequently cited as a critical element of the growth of individual firms and the economy in general (Hasan and Tucci, 2010).

Even though it is agreed that there is correlation between firm size and innovation, many studies examine the issue of innovation relating to company size with inconclusive findings (Acs and Audretsch, 1987; 1990; 1991; Cohen and Klepper, 1996; Damanpour, 2010; Freeman and Soete, 1997; Kamien and Schwartz, 1975; Pavitt et al., 1987; Rothwell and Zegveld, 1986; Tsvetkova et al., 2014; Wagner and Hansen, 2005). For instance, Acs and Audretsch's (1987) findings suggest the average innovation rate for small firms was 43% higher than large firms in 1982, however this does not imply the answer to the question of 'Which firm size is more innovative?' is the 'small firm'. Despite the relative innovative activities between large- and small-medium enterprises, as De Jong and Marsili (2006) argued, there is research evidence to suggest new small firms are continually entering the market with new ideas, products and processes.

Furthermore, Griliches (1986) argued that larger firms can afford to invest in long-term research with high potential returns but smaller firms cannot — either for financial reasons, or because of the high technological complexity of these projects. This is contrary to other studies, which have contested that because of their nature, SMEs — particularly those operating in manufacturing, electronics, engineering and general high technology industries — are able to undertake radical innovation more easily than large firms. The same studies argue that introducing pioneering products is essential for the sustainability of SMEs (Kanter, 1985; Simon et al., 2002). Similarly, empirical findings confirm small firms cannot wait for the payoff from their innovative activities, and focus on short-term incremental (rather than radical) innovations (Kafourous, 2008; Pavitt et al., 1987; Piergiovanni et al., 1997). Moreover, several studies suggest the opportunity for small firm innovation tends to be highest when the industry is in the early stages of the product life-cycle (e.g., Pavitt and Wald, 1971).

Markedly, a number of British small, medium-size manufacturing enterprises (SMMEs) have survived and thrived through the release of innovative new

products (Laforet and Tann, 2006). Thus, the contention is that small firms who innovate successfully increase their chances of survival and growth (Cefis and Marsili, 2003). In the UK there is evidence to suggest policy makers see an important link between innovation and business, and economic growth. The recognition of the importance of innovation in SMEs has led to the development of the National Systems of Innovation in several countries, as well as the formation of innovation clusters and regional reservoirs of knowledge (Filippetti and Archibugi, 2011).

From all the above it is evident that not only is innovation related to firm size, but also that different types of innovation affect companies in different ways. The ability to determine the scale of innovation activities and the characteristics of innovative firms is a prerequisite for the pursuit and analysis of policies aimed at fostering innovation at a regional level. The standard measures of innovation activity such as Research and Development activity or R&D intensity or other common measures such as patents provide little indication of the nature of innovation. Policy development requires further advances in the analysis of information, particularly in terms of the relationship between different types of innovation and growth without excluding the need for survival. Furthermore, previous research was more focused on technology intensive or dependent industries and sectors, with less recognition on the importance of innovation in less R&D intensive industries such as services, low-technology manufacturing and other sectors of the economy that contribute significantly to employment and economic growth.

Shelton and Percival's (2003) findings suggest innovation priorities vary widely by sector, with the focus spread across products, technology and services yet innovation is a key driver of organic growth for all companies regardless of sector or geography. Similarly, Anderson *et al.* (2014) argue innovation has become an increasingly important determinant of organisational performance, success and long-term survival.

Additionally, previous studies have focused on technological, product and process (TPP) innovations. Since then, there has been a growing sense that much of innovation in service sectors of the economy is not adequately captured in the TPP concept. As a result, the OECD (2005) argue the concept of innovation needs to be expanded to include marketing and organisational innovation, and take account of different forms of product and market innovation, in order to provide a more complete analytical framework and one better able to capture the changes that affect firm performance. Moreover, the majority of previous studies took a national or even international perspective.

The relationship between economic growth and innovation on one hand, and firm size on the other, is evident and well recognised. The relationship between different types of innovation and growth has been a more controversial issue. Aiming to fill these gaps in the pertinent literature, this study is set within a public policy context defined by localism, and an aspiration to reflect business interests in the development and implementation of local policies (Gov, 2010) to establish the connections between different forms of innovation and the anticipated growth of SMEs at City Region level.

Literature Review

Innovation and growth in SMEs

Research on innovation spans a number of disciplines with economic approaches alone adopting several alternative theoretical perspectives each of which offers useful and significant insights. In order to provide the theoretical basis for this study, we reviewed previous studies on the types of innovation and literature that investigated the link between innovation, SMEs and growth. Previous studies cover a range of products, services, processes and organisations and encompass a broad range of innovation types including technological (Pratali, 2003), and non-technological such as, strategic (Turock, 2001), organisational (Salavou *et al.*, 2004), marketing (Johne and Davies, 2000), process (Khazanchi *et al.*, 2007) and/or administrative (Tarry, 2000).

On this basis, Schumpeter (1934; 1939) identified several types of innovation classified as technological and non-technological innovations, including the introduction of new products, the introduction of new methods of production and the opening of new markets. Product innovation, which may include new product offerings or improvements in existing products, appears to be the most common form of innovation. Also, service innovation has become increasingly important and can be described as new developments in those activities undertaken to deliver the core product and make it more attractive to consumers. Gadrey *et al.* (1995) defined service innovations as innovations in processes and innovations in organisation for existing service products. Service innovations can therefore be described as new developments in activities undertaken to deliver core service products for various reasons, for instance to make those core service products more attractive to consumers. Organisational innovation refers to the implementation of new organisational methods not previously used in the firm, while a marketing innovation is the implementation of a new marketing

method (OECD/ESTAT, 2005: 172–180; Abernathy and Utterback, 1978; Trott, 1998).

The technological view on innovation has been criticised as biased towards innovation in manufacturing and not able to fully capture innovation in services (Hipp and Grupp, 2005; Hipp *et al.*, 2000 cited in Schmidt and Rammer, 2007). Furthermore, firms often adopt and re-organise business routines, internal organisation, external relations and marketing (Baranano, 2003; Boer and During, 2001). Innovation management scholars stress the importance and emphasise the crucial role of integrating technological and non-technological innovations for successfully transferring new ideas and new business opportunities into market success (Cozzarin and Percival, 2006; Tidd *et al.*, 2001; Griffin and Hauser, 2001).

Similarly, Slater and Narver (1995) argued the most likely way in which service companies innovate is by developing new services or reformulating existing ones, plus creating new distribution channels and discovering new approaches for management. These are essentially marketing innovations as they represent ways in which companies can develop new methods of marketing to potential or existing customers. *Marketing* innovations should not be confused with *market* innovations that, according to Johne and Davies (2000), are concerned with activities such as the entry into new markets. Another type, process innovation, involves creating or improving methods of production, service or administrative operations (Khazanchi *et al.*, 2007) as well as, developments in the processes, systems and re-engineering activities undertaken to develop new products.

The innovation process has been defined as radical or incremental innovation, imitated or completely new, improved or revolutionary, technological or organisational types and many other kinds. (Edosomwan, 1989; Tohidi and Jabbari, 2011; Tohidi, 2011; Evangelista *et al.*, 2001; Tohidi *et al.*, 2010). In Schumpeter's view 'radical' innovations create major disruptive changes, whereas 'incremental' innovations continuously advance the process of change.

The idea that innovation is a linear and sequential process proceeding through specific steps (see Kline and Rosenberg's model 1986), has been replaced by a systemic approach to innovation. The systemic approach has recognised, therefore, that in addition to the usual innovation inputs, external sources of innovation have to be considered in order to explain in particular small firms' innovation (De Propriis, 2002). Oke *et al.* (2007) have distinguished between innovation performance and business performance based on the premise that a good innovation performance does not necessarily translate into a good business performance.

Previous studies have used different measures to assess the innovation performance of firms. Generally, outcome level measures of innovation have been based on financial and non-financial metrics (Avlonitis *et al.*, 2001; Cooper and Kleinschmidt, 1995). Edquist and McKelvey (2000) and Lundvall (1992) argue the innovation process should rather be considered as a circular and complex system embracing interactive elements. In addition, a lot of the literature focuses on learning regions (Simmie, 1997; Maskell *et al.*, 1998; Boekema *et al.*, 2000; Nyhan and Attwell, 2000; Lorenzen, 2001), in order to bind together the concepts of innovation and locality.

Some of the early work on innovation and SMEs tends to adopt the view that innovation involves making fundamental or radical changes comprising the transformation of a new idea into a marketable product or process (Freeman, 1971). Conversely, Porter (2000), views innovation as an attempt for companies to defend their existing competitive position as well as seek new competitive advantages. A recent survey by Shelton and Percival (2013) found that innovation is a driver for rapid and profitable revenue growth and recognised by the executives interviewed as being integral to sustain the long-term future as well as the competitive position of their business.

Summarising, a number of studies have documented the positive impact of innovation on SMEs' rate of growth (Becchetti and Trovato, 2002; Lu and Beamish, 2001; Yasuda, 2005). In particular, innovation can create new, uncontested product markets, as well as increased consumers' willingness to pay by adding or improving product features (Cho and Pucik, 2005; Cohen and Klepper, 1996). Moreover, innovative firms are better able to benefit from spillovers, and are less sensitive to adverse macroeconomic shocks (Geroski *et al.*, 1993). Therefore, a firm may take a reactive approach and innovate to avoid losing market share to an innovative competitor or it may take a proactive approach to gain a strategic market position relative to its competitors by developing new products or services.

Most of the previous studies have analysed the impact of innovation on SMEs' growth and there is 'agreement' in the literature that innovation in different settings plays an important role in the survival, growth and competitiveness of firms but the previous research findings are inconclusive with regards to the type and scale of innovation activities at local levels and in particular the impact on SMEs growth. However a number of scholars, including Schumpeter (1934), assumed similar effects on market structures and firm performance which raises the question about the role played by various types of innovation.

Hypotheses development

It is widely recognised that growth is vital to all businesses and in particular to SMEs (Golovko and Valentini, 2011). There is substantial evidence suggesting SMEs in a variety of sectors engage in innovative activities, and these activities are likely to be an important determinant of performance and growth (See Becchetti and Trovato, 2002; Cooper and Kleinschmidt, 1986; Rothwell, 1991; Lawton-Smith *et al.*, 1991; SBRC, 1992; Joyce *et al.*, 1994; Keeble, 1992; Barber *et al.*, 1989; Moore, 1993; Herbert, 1988; Yasuda, 2005). Love and Roper (2013) argue those SMEs with a track record of innovation are more likely to export successfully, and more likely to generate growth from exporting than non-innovating firms. They also suggest for firms of all sizes that there is a strong positive relationship between innovation, exporting and productivity and/or growth but evidence on the inter-relation between innovation and exporting in SMEs specifically, is limited.

Previous studies suggest that SMEs' innovative activities are more likely to involve product innovation than process innovation. In addition, their innovative activities are focused more on producing products for niche markets rather than mass markets, and generate both radical and incremental innovations likely to be associated with growth in output, turnover and employment (Brouwer *et al.*, 1993; Pratten, 1991; Storey, 1993; Keeble, 1992; Cannon, 1985; Keeble and Walker, 1993; Oakey, 1990; Lee and Oakes, 1995; Hartman *et al.*, 1994; Henderson, 2002; Goh and Ridgway, 1994). Moreover, the literature provides considerable evidence of the direct contribution of workforce, managerial and marketing skills to innovation, and link between innovation and growth in employment, but again the literature on SMEs specifically is limited (See Leiponen, 2005; Freel, 2005; Vivarelli, 2012). The majority of empirical studies have found a positive relationship between product innovation and employment growth (König *et al.*, 1995; Van Reenen, 1997; Greenan and Guellec, 2000; Hall *et al.*, 2008; Peters *et al.*, 2013; Harrison *et al.*, 2014).

However, the scope and size of performance enhancing effects of innovation at the level of the innovating firm depends on the type of innovative activity and degree to which innovation outputs (new products, new processes) are successfully implemented and succeed the market (see Stoneman, 1983; Katsoulacos, 1984; Peters, 2008). Empirical evidence on the employment effects of process innovations is less clear. Van Reenen (1997), Entorf and Pohlmeier (1990) and Hall *et al.* (2008) found the effect of process innovation on employment to be small or statistically insignificant. On the contrary, other studies found a significant positive

effect of process innovation on employment growth (Lachenmaier and Rottmann, 2011; König *et al.*, 1995; Smolny, 2002; Greenan and Guellec, 2000).

On the basis of the above discussion and aiming to contribute to the debate about the link between innovation and SMEs' growth and in particular to provide empirical evidence as to what role different types of innovation play on SMEs' growth, the following hypotheses have been developed:

- H1:** *Firms are more likely to anticipate growth in sales when they undertake (a) product, (b) process, (c) marketing and (d) organisational innovation.*
- H2:** *Firms are more likely to anticipate growth in profitability when they undertake (a) product, (b) process, (c) marketing and (d) organisational innovation.*
- H3:** *Firms are more likely to anticipate growth in employment when they undertake (a) product, (b) process, (c) marketing and (d) organisational innovation.*
- H4:** *Firms are more likely to anticipate growth in exports when they undertake (a) product, (b) process, (c) marketing and (d) organisational innovation.*

Methodology

The Leeds City Region Small- and Medium-Sized Enterprise (SME) Innovation Survey is a telephone-based survey of 250 independent organisations based in the Leeds City Region (LCR). This unique survey is designed and conducted at the enterprise as opposed to establishment level since the survey sought to identify the innovation dynamics of local firms and did not want to include sites that were part of larger groups based outside the LCR. The survey has two principal aims: (i) to test out a methodology to empirically explore firm-based innovation activity and performance amongst SMEs in the LCR and (ii) to collect data to inform the development and targeting of local services to support firm-based innovation in the area. For the purposes of this survey, SMEs are defined as those employing between 10 to 250 employees. The exclusion of micro enterprises (employing under 10) from the study's sampling frame is purposeful and influenced by several factors, most importantly that micro enterprises tend to be qualitatively different from 'larger' SMEs and increasingly seen as a distinct analytical category in their own right.

A stratified random sampling with both size and sector was deployed. The survey's sample was selected in order to be representative of independent SMEs in the LCR in the commercial and charitable sectors of the economy. The profile

of the population was established through the Office for National Statistics based on data from Inter-Departmental Business Register (IDBR) statistics. Quotas were set for the numbers of interviews to be achieved related to size and sector to minimise the impact of sample bias, which may have occurred due to differential rates of response among enterprises of different sizes or sectors. Given the policy emphasis on the manufacturing sector and its pre-eminence in innovation discourse, a relatively large quota was set for this sector to ensure the sample base was sufficient to provide a foundation for sub-sector analysis. The contact details for employers were sourced from a commercial database of establishments and interviews were conducted with the owner or senior business representative of the SME. The characteristics of the sample are indicated in Table 1 below.

Table 1. Sample characteristics.

	<i>n</i>	%
Size		
10–49	158	63
50–249	91	36
Sector		
Primary and manufacturing	9	4
Construction	74	30
Wholesale/Retail	30	12
Transport/storage	20	8
Food/accommodation	9	4
Information/communication	19	8
Finance/Real Estate	16	6
Professional services	26	10
Administrative and public	47	19
Single Multi Site		
Single site	182	73
Multi–site (HQ in Leeds)	68	27
Age		
Less than 5 years	28	12
6–10 years	40	16
11–20 years	64	26
20–50 years	79	32
50+ years	33	14

Note: Base: All respondents (non-weighted).

Although obtaining data from a single key informant increases the risk of common method variance (Podsakoff *et al.*, 2012), in the current survey the characteristics of the variables, the informants and the firms offer reassurance on the validity and reliability of the data. Specifically, in the study the questions relate to (a) objective constructs, (b) salient events and (c) phenomena internal to the firm. Also, the informants (d) are working in higher hierarchical positions, (e) have a long tenure and the firms are (f) relatively small and (g) relatively old. All these indicate the reliability and validity of the data were ensured by the data collection process (Homburg *et al.*, 2012).

The survey questionnaire was informed by the OECD guidelines associated with firm-based innovation (OECD/ESTAT, 2005). It contained sections that sought to ensure only independent firms contributed to the research and collected data on the characteristics of independent SMEs and a variety of forms of innovation and SME performance.

Four classifications are used to indicate innovative activity that had taken place in the SMEs during the last 12 months:

- Product: the introduction of a good or service that is new with respect to its characteristics or intended uses.
- Process: the implementation of a new production or delivery method.
- Marketing: aimed at better addressing customer needs or opening up new markets with an objective of increasing sales.
- Organisational: the implementation of a new organisational method in the firm's business practices or workplace organisation.

Four measures of anticipated growth were used:

- Sales (turnover)
- Profitability
- Number employed and
- International sales

The analysis draws on the questions associated with innovation activity in the past 12 months and the entrepreneurs' expectations of growth in the next 12 months. The analysis in this paper explores the relationship between types of innovation and likelihood of SME growth and high growth (defined as anticipated growth in sales or employment by 20% or more). The questionnaire also included sections on performance management and networking that do not feature in the following analysis.

Analysis

Method

Mantel–Haenszel common odds ratios are widely used in academic studies for two main reasons: they provide an estimate (with confidence interval) of the association between two binary variables and they have a convenient interpretation. The particular method has been used several times in recent similar studies (Vuong *et al.*, 2013; Hechavarria *et al.*, 2012). Odds ratios represent the ratio of the probability that an event will happen relative to the probability the event will not happen; in our case we link the probability that a manager will expect a type of growth to the probability that the firm has introduced an innovation. If the probabilities of the events occurring are p_1 for expected future growth and p_2 for past innovation, then the odds ratio is:

$$\frac{p_1/(1-p_1)}{p_2/(1-p_2)}. \quad (1)$$

An odds ratio equal to 1 indicates the expectation of growth is equally likely to occur irrespective of whether the firm has undertaken innovation activities, and hence the type of growth and innovation are likely to be independent and unrelated. An odds ratio greater than 1 indicates managers are more likely to expect growth if they did introduce an innovation. The Mantel–Haenszel common odds ratio estimate is asymptotically normally distributed around the common odds ratio assumption of unity. To test whether the estimates of the odd ratios have occurred by chance Pearson χ^2 test was employed.

Results

Table 2, presents a cross-tabulation (counts) corresponding to whether firms introduced new products over the last 12 months and whether the manager considers the business will grow in terms of sales (turnover) in the next 12 months. Out of 245 managers who responded to both questions, 46.1% (113/245) indicated they had introduced new products to their organisations in the previous 12 months and expected sales growth in the next 12 months; this corresponds to 14.6% (36/245) of the sample who stated the opposite. Also, there are firms who introduced new products to their organisation in the previous 12 months but do not expect sales growth in the next 12 months (6.9%; 17/245) as well as firms

Table 2. Cross-tabulation of new product innovation with anticipated sales growth.

		In the last 12 months, has your organisation introduced any new products?		Total
		Yes	No	
In the next 12 months, do you think that the business will grow in terms of ...? Sales (turnover)	Yes	113	79	192
	No	17	36	53
Total		130	115	245

who did not introduce new products in the previous 12 months but expected growth of sales in the next 12 months (32.2%; 79/245).¹

Application of the Mantel–Haenszel common odds ratio procedure noted above to the cross-tabulation in Table 2 provides the results presented in Table 3. The estimated odds ratio of 3.029, which is statistically significant at the 1% level, indicates the following: the odds of a firm expecting sales growth in the next 12 months is 3.029 times higher if the firm had introduced new products in the last 12 months than if the firm had not introduced new products in the last 12 months. This estimation procedure is replicated for all measures of innovation and all measures of growth across the entire sample in Table 4.

Table 4 is categorised according to the four groups of innovations and four types of growth. The results indicate that growth in sales is associated with all

Table 3. Mantel–Haenszel common odds ratio estimate.

Estimate		3.029
ln (Estimate)		1.108
Standard error of ln (Estimate)		0.329
Asymptotic significance (two-sided)		0.001
Asymptotic 95% confidence interval	Lower bound	1.590
	Upper bound	5.770

¹In order to be able to estimate odds ratios all four cells require a positive number, when this does not occur, as is the case in a couple of occasions in Table 5 below, it is not possible to compute a useful odds ratio and therefore we highlight this instance with an ‘n/a’.

Table 4. All firms.

	Increase sales (q10a)	Increase profits (q10c)	Increase employment (q10e)	Increase exports (q10g)
Product innovations				
Introduced new product codes (extensions)	3.029***	1.994**	1.349	2.312***
Introduced products new to business	1.350	0.990	0.616	0.941
Introduced products new to market	1.374	1.961	1.755	2.181*
Process innovation				
Introduced new ways to improve efficiency	2.288**	2.143**	1.623	1.964*
Marketing innovations				
Radical changes in packaging	4.727	5.276	1.155	2.370*
Radical changes in placement	5.265**	1.873	1.554	2.298**
Radical changes in promotion	2.952***	2.039**	1.738**	1.432
Radical changes in pricing	3.637***	1.825*	1.839**	0.829
Radical changes in product design	3.375***	2.726***	2.430***	2.018**
Organisational innovations				
Policies and procedures	2.403**	1.268	1.705**	1.283
Outsourcing	2.766*	1.460	1.948*	1.402
Initiatives to encourage job satisfaction	3.033***	1.739*	2.134***	1.362
Investment in new technology	4.235***	3.066***	3.409***	1.846**
Investment in training and development	3.740***	2.517***	3.319***	2.003*

Note: ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

four types of innovation, since all relevant estimates are greater than 1 and most of them are statistically significant. Hence, hypotheses H1a, H1b, H1c and H1d are accepted. For product innovations new to the business or new to the market, as well as for radical changes in packaging the estimates, although greater than 1, were not found significant ($p > 0.1$). Similarly, all four types of innovation influence the possibility of growth in terms of profit increase, as most of the pertinent estimates are statistically significant. The estimates for some of the subcategories were not found significant ($p > 0.1$), but since the influence on profit growth is strong for at least one subcategory from each type of innovation, hypotheses H2a, H2b, H2c and H2d can be accepted.

Regarding the third type of growth included in the study, product and process innovations are not strongly associated with increases in employment ($p > 0.1$).

The innovation-type mostly associated with employment growth is organisational innovation, such as investment in new technology or in training and development. Firms with installed marketing innovations are also more likely to be expecting an expansion in their number of workers, but less so if these marketing innovations are related to radical changes in packaging or placement ($p > 0.1$). On this basis, hypotheses H3a and H3b are rejected, whereas hypotheses H3c and H3d are accepted.

Finally, all four types of innovation are associated with expectations of increases in exports. Even though the estimates for some of the subcategories were not found significant ($p > 0.1$), the impact on expected export growth is strong for at least one subcategory from each type of innovation. Hence, hypotheses H4a, H4b, H4c and H4d are accepted. Of great importance here is that radical marketing innovation is significantly associated with expectations of increases in exports. This may reflect business activity stimulated by improved information associated with export markets and distribution channels to reach these markets. Radical changes in product design in response to receiving information from overseas markets may also be the reason behind why results have identified that radical changes in product design over the last 12 months are associated with expectations of increases in exports.

From a policy perspective, the results of the study indicate for those companies wishing to stimulate greater sales growth it may be opportune to encourage innovation in radical changes in placement, as odds of a firm expecting sales growth in the next 12 months is 5.265 times higher if the firm had introduced these changes in the last 12 months relative to those firms who had not introduced radical changes in placement in the last 12 months. Also, the results indicate those policy makers wishing to stimulate increases in profits should encourage investment in new technologies, as odds of a firm expecting profit growth in the next 12 months is 3.066 times higher if the firm had introduced these changes in the last 12 months relative to those firms who had not invested in new technologies over the last 12 months.

Similarly, those policy makers wishing to stimulate increases in employment should encourage investment in new technologies or training and development, as odds of a firm expecting employment growth in the next 12 months is 3.409 and 3.319 times higher, respectively, if the firm had introduced these changes in the last 12 months relative to those firms who had not. Furthermore, those policy makers wishing to stimulate increases in exports should encourage radical changes in packaging and placement, as emphasised above, or product innovation (new products to the market), as odds of a firm expecting employment growth

in the next 12 months are at least two times higher, respectively, if the firm had introduced these changes in the last 12 months relative to those firms who had not.

High growth firms

There is much interest and attention in high growth firms, either to identify who these currently are or who they are likely to be in the near future. The results presented above were re-estimated using the dichotomous growth indicator related to whether the manager predicted growth in sales or employment over the next 12 months to be greater than 20%. The corresponding results are presented in Table 5 and several points are worth highlighting:

First, it becomes clear that fewer and slightly different innovations are associated with expectation of very high levels of growth. For instance, evidence in Table 5 suggests a much stronger relationship between the introduction of new products to the market and growth expectations and product innovation is not significantly associated with expectations of high growth unless they are new products to the market.

Second, firms that undertook organisational innovations over the last 12 months remain much more likely to expect high sales growth, but the innovations associated with growth in other areas are less clear. For instance, radical changes in product design, which are probably associated with the introduction of new products to the market, are the only product, process or marketing innovation associated with expectations of high profit growth. It may be unsurprising that outsourcing is the innovation-type with the strongest association with expectations for high profit growth, although this may have a strong product life-cycle component and vary across sectors.

Third, policy makers seeking to encourage innovation in order to stimulate high rates of employment growth appear to have four innovation areas to encourage: one is to encourage new products to the market which again is probably closely associated with radical changes in product design; another is outsourcing, which may save costs that could then be redirected to other areas of the business with a shortage of workers. A further area to encourage innovation in order to stimulate larger employment growth expectations is linked to investments in new technologies. Extant literature emphasises this is a complex issue as technological change can have a skilled-bias, unskilled-bias, sector-bias or a combination of all of three, thereby suggesting an intricate knowledge of the firm is required for the most effective policy recommendation.

Table 5. Comparable results for high growth firms.

	High sales growth (>20%)	High profit growth (>20%)	High employment growth (>20%)	High exports growth (>20%)
Product innovations				
Introduced new product codes (extensions)	1.500	0.860	0.874	1.768
Introduced products new to business	0.765	0.625	0.708	n/a
Introduced products new to market	2.424**	3.611*	3.481*	2.667
Process innovation				
Introduced new ways to improve efficiency	1.528	1.242	1.812	2.135
Marketing innovations				
Radical changes in packaging	1.789	0.887	2.143	2.300
Radical changes in placement	1.121	1.449	1.157	1.777
Radical changes in promotion	1.558	1.335	0.714	3.879**
Radical changes in pricing	1.867*	1.747	1.226	2.876*
Radical changes in product design	1.629	2.195**	2.000*	1.460
Organisational innovations				
Policies and procedures	3.127***	1.903*	0.889	5.238**
Outsourcing	5.109***	4.042***	2.196*	3.419**
Specific initiatives to encourage job satisfaction	3.592***	1.497	1.369	2.494
New technology	4.763***	2.167*	3.437***	2.794
Training and development	2.130*	1.103	1.558	2.122

Note: ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively. 'na' indicates that values are not available due to a lack of observations in cells i.e., there are no high export growth firms that reported no organisational innovations.

Conclusions and Discussions

Innovation as a concept and its empirical measurement are open to multiple understandings and interpretations. The literature is wide ranging and diverse, adopting a range of perspectives and presenting results associated with different typologies of innovation at the micro and macro level. The starting point for this research was the indication arising from previous work, that there is a connection between innovation and SMEs' growth but there was not enough previous

research that was looking into the connections between different forms of innovation and the anticipated growth within different regions.

The contribution of the current study lies in that it established a methodology that provides an evidence base to inform the development of innovation policy for the SME 'market' at the local level and established the connections between different forms of innovation and the anticipated growth (using four measures) of SMEs. The survey methodology provides an empirical basis for discussion on the nature of innovation and its contribution to different areas of SME growth. In addition, the focus on the LCR allows us to provide a focused and detailed assessment of the association between types of innovation and types of growth that could not be done accurately at a national level without an extremely large representative dataset.

This study also provides robust and timely intelligence to inform operational support for SMEs' innovation and strategic development of local innovation policy. The research may be used for a number of purposes including the targeting of further intelligence gathering associated with, for example, the barriers to innovation faced by local SMEs, raising awareness of existing services, identifying gaps in supply or the potential development of new services to support different types of innovation. It has the potential to contribute to the development of local innovation strategy, informed by the practice of local SMEs as opposed to the requirements of programmes developed by, for example, Government Departments, LEPs, Further and Higher Educational Institutions and other public sector organisations who often struggle to engage a representative sample of SMEs in the design of programmes and policies. The authors plan to adopt a reflexive process to explore research impact with local stakeholders that will help assess the utility of the methodology and its findings, and continue to shape further research in this area.

The findings confirm the central role innovation plays in shaping the growth of SMEs employing between 10 and 250 people in Leeds, and are consistent with prior research suggesting firms engaged in multiple forms of innovation are more likely to grow (and grow faster) than those that do not (Von Tunzelmann, 1995). It provides evidence of the types of innovation most likely to result in achieving policy aims associated with, for example, the development of international markets (product development and investment in training) or growth of employment opportunities (investment in new technology and training and development), highlighting the need to align business support for innovation with human capital (education/training) interventions at the local level. In the case of 'high growth' firms, innovations associated with development of policies and

procedures are most likely to lead to anticipated growth in export sales, those associated with outsourcing most likely to lead to growth in domestic sales and profit growth and innovations associated with investments in new technology most likely to lead to high employment growth. The findings of this study illustrates a clear link between innovation, growth and economic performance, something which highlights why innovation policy is so important to the regions. Finally, the synergies identified between SME innovations and exporting suggest the value of co-ordinated support mechanisms and conducive policies at regional level.

Limitations and Suggestions for Future Research

This study, although offering useful conclusions, is tempered by some limitations. Firstly, it has adapted and applied the conceptual framework of the OSLO Manual (OECD/ESTAT, 2005) and sought to apply some common meanings to common forms of innovation — product, process, marketing and organisation. This does not provide a holistic framework and we recognise further conceptual and empirical development may be required. For instance, a key limitation of the current analysis is the absence of discussion associated with open innovation and networking which is recognised as a key feature of SME innovation (Rothwell, 1992). Similarly, no formal models of industrial concentration and industrial geography have been used. Future research should follow this approach and enrich our study's findings.

In addition, the present study is focused on one region — specifically the LCR. Another suggestion for future researchers would be to carry out comparable research focused on other city regions. This would prove useful in assessing the external validity of our results, in enhancing their generalisability, and in drawing out important city-region-specific idiosyncrasies. Finally, often the innovating firms are very adept at working across the interface of local and global knowledge transfers networks. This raises questions that future research could investigate over the relative importance of regional versus international knowledge spill overs for the innovative.

References

- Abernathy, WJ and J Utterback (1978). Pattern of industrial innovation. In *Readings in the Management of Innovation*, ML Tushman and WL Moore (eds.), New York, NY: HarperCollins.

- Acs, ZJ and DB Audretsch (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, 69(4), 567–574.
- Acs, ZJ and DB Audretsch (1991). R&D, firm size, and innovative activity. In *Innovation and Technological Change: An International Comparison*, ZJ Acs and DB Audretsch (eds.), New York: Harvester Wheatsheaf.
- Ahmad, ZS and RS Xavier (2012). Entrepreneurial environments and growth: Evidence from Malaysia GEM data. *Journal of Chinese Entrepreneurship*, 4(1), 50–269.
- Anderson, N, K Potočník and J Zhou (2014). Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework. *Journal of Management*, 40(5), 1297–1333.
- Arando, S, I Peña and I Verheul (2009). Market entry of firms with different legal forms: An empirical test of the influence of institutional factors. *International Entrepreneurship and Management Journal*, 5(1), 77–95.
- Avlonitis, GJ, PG Papastathopoulou and SP Gounaris (2001). An empirically-based typology of product innovativeness for new financial services: Success and failure scenarios. *Journal of Product Innovation Management*, 18(5), 324–342.
- Aziz, AS and R Mahmood (2011). The relationship between business model and performance of manufacturing small and medium enterprises in Malaysia. *African Journal of Business Management*, 5(22), 8918–8932.
- Baranano, AM (2003). The non-technological side of technological innovation: State-of-the-art and guidelines for further empirical research. *International Journal of Entrepreneurship and Innovation Management* 3, 107–125.
- Barber, J, S Metcalfe and M Porteous (eds.) (1989). *Barriers to Growth in Small Firms*. London: Routledge.
- Beaver, G and P Carr (2002). The enterprise culture: Understanding a misunderstood concept. *Journal of Strategic Change*, 11(2), 105–113.
- Becchetti, L and G Trovato (2002). The determinants of growth for small and medium sized firms: The role of the availability of external finance. *Small Business Economics*, 19(4) 291–306.
- Boekema, F, K Morgan, S Bakkers and R Rutten (2000). *Knowledge, Innovation and Economic Growth*, Cheltenham: Edward Elgar.
- Boer, H and WE During (2001). Innovation, what innovation? A comparison between product, process and organisational innovation. *International Journal of Technology Management*, 22, 83–107.
- Brouwer, E, A Kleinknecht and J Reijnen (1993). Employment growth and innovation at the firm level: An Empirical Study. *Journal of Evolutionary Economics* 3, 153–159.
- Cannon, T (1985). Innovation, creativity and small firm organisation. *International Small Business Journal*, 4, 33–67.
- Carr, M, A Chen and J Tate (2000). Globalization and home-based workers. *Feminist Economics*, 6(3), 123–142.
- Cefis, E and O Marsili (2003). Survivor: the role of innovation in firm's survival, No.03-18. WPTKoopans Institute, USE, Utrecht University in Laforet, S. (2008) Size, strategic, and market orientation affects on innovation. *Journal of Business Research* 61(7), 753–764.

- Cho, H and V Pucik (2005). Relationship between innovativeness, quality, growth, profitability, and market value. *Strategic Management Journal*, 26(6), 555–575.
- Cohen, WM and S Klepper (1996). Firm size and the nature of innovation within industries: The case of product and process R&D. *The Review of Economics and Statistics*, 78(2), 232–243.
- Cooper, RG and E Kleinschmidt (1986). An investigation into the new product process: Steps, deficiencies and impact. *Journal of Product Innovation Management*, 3(2), 71–85.
- Cooper, RG and EJ Kleinschmidt (1995). Benchmarking the firm's critical success factors in new product development. *Journal of Product Innovation Management*, 12(5), 374–391.
- Cozzarin, B and J Percival (2006). Complementarities between organizational strategies and innovation. *Economics of Innovation and New Technology*, 15, 195–217.
- Damanpour, F (2010). An integration of research findings of effects of firm size and market competition on product and process innovations. *British Journal of Management*, 21(4), 996–1010.
- De Jong, PJJ and O Marsili (2006). The fruit flies of innovations: A taxonomy of innovative small firms. *Research Policy*, 35, 213–229.
- De Propriis, L (2002). Types of innovation and inter-firm co-operation. *Entrepreneurship and Regional Development*, 14, 337–353.
- Dickson, PH and KM Weaver (2008). The role of the institutional environment in determining firm orientation towards entrepreneurial behaviour. *International Entrepreneurship Management Journal*, 4(4), 467–483.
- Dobbs, M and R Hamilton (2007). Small business growth: Recent evidence and new directions. *International Journal of Entrepreneurial Behaviour and Research*, 13(5), 296–322.
- Edosomwan, JA (1989). *Integrating Innovation and Technology Management*, John Wiley & Sons: New York.
- Edquist, C and M McKelvey (2000). *Systems of Innovation: Growth, Competitiveness and Employment*, Cheltenham: Edward Elgar.
- Evangelista, R, S Imammarino, V Mastrostefano and A Silvani (2001). Measuring the regional dimension of innovation: Lessons from the Italian innovation survey. *Technovation*, 21, 733–755.
- Filippetti, A and D Archibugi (2011). Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research Policy*, 40(2), 179–192.
- Freel, MS (2005). Patterns of innovation and skills in small firms. *Technovation*, 25, 123–134.
- Freeman, C (1971). The role of small firms in innovation in the united kingdom since 1945: Report to the Bolton Committee of inquiry on small firms. Research Report No. 6. HMSO, London.
- Freeman, C and L Soete (1997). *The Economics of Industrial Innovation*, Cambridge, MA: The MIT Press.
- Freeman, J, GR Carroll and MT Hannan (1983). The liability of newness: Age dependence in organizational death rates. *American Sociological Review*, 48(5), 692–710.
- Gadrey, J, F Gallouj and O Weinstein (1995). New modes of innovation: how services benefit Industry. *International Journal of Service Industry Management*, 6(3), 4–16.

- Gavron, R, M Cowling, G Holtham and A Westall (1998). *The Entrepreneurial Society*, London, Institute for Public Policy Research.
- Geroski, P, S Machin and J Van Reenen (1993). The profitability of innovating firms. *Rand Journal of Economics*, 24(2), 198–211.
- Goh, PL and K Ridgway (1994). Implementation of TQM in SMEs: A survey of progress and attitudes, operation and performance. In *1st International Conf. the European Operation Management Association*, University of Cambridge, June, pp. 567–573.
- Golovko E and G Valentini (2011). Exploring the complementarity between innovation and export for SMEs' growth. *Journal of International Business Studies*, 42, 362–380.
- Gov, HM (2010). Local Growth. Realising Every Place's Potential. Available at <http://www.bis.gov.uk/assets/biscore/economic-development/docs/l/cm7961-local-growth-white-paper.pdf> (accessed on July 2013).
- Greenan, N and D Guellec (2000). Technological innovation and employment reallocation. *Labour*, 14, 547–590.
- Griffin, A and JR Hauser (2001). Integrating R&D and marketing: a review and analysis of the literature. *Journal of Product Innovation Management*, 13, 191–215.
- Griliches, Z (1986). Productivity, R&D, and basic research at the firm level in the 1970s. *American Economic Review*, 76(1), 141–154.
- Hall, BH, F Lotti and J Mairesse (2008). Employment, innovation, and productivity: Evidence from Italian microdata. *Industrial and Corporate Change*, 17, 813–839.
- Harris, ML and SG Gibson (2006). Determining the common problems of early growth of small businesses in Eastern North Carolina. *SAM Advanced Management Journal*, 71(2), 39–45.
- Harrison, R, J Jaumandreu, J Mairesse and B Peters (2014). Does innovation stimulate employment? A firm-level analysis using comparable micro-data from four European countries. *International Journal of Industrial Organization*, 35, 29–43.
- Hartman, A, E Burk, C Tower and T Sebor (1994). Information sources and their relationship to organisational innovation in small businesses. *Journal of Small Business Management*, 32, 36–46.
- Hasan, I and CL Tucci (2010). The innovation–economic growth nexus: Global evidence. *Research Policy*, 39(10), 1264–1276.
- Hechavarria, DM, M Renko and CH Matthews (2012). The nascent entrepreneurship hub: Goals, entrepreneurial self-efficacy and start-up outcomes. *Small Business Economics*, 39(3), 685–701.
- Henderson, J (2002). Building the rural economy with high-growth entrepreneurs. *Economic Review*, 87(3), 45–70.
- Herbert, C (1988). Inter-firm information flows and innovation in small firms. In *11th National Small Firms Policy and Research Conf.*
- Heseltine, M (2012). No stone unturned in pursuit of growth. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34648/12-1213-no-stone-unturned-in-pursuit-of-growth.pdf (accessed on July 2013).
- Hipp, C and H Grupp (2005). Innovation in the service sector: The demand of service-specific innovation measurement concepts and typology. *Research Policy*, 34, 517–535.

- Hipp, C, B Tether and I Miles (2000). The incidence and effects of innovation in services: Evidence from Germany. *International Journal of Innovation Management*, 4, 417–453.
- Homburg, C, M Klarmann, M Reimann and O Schilke (2012). What drives key informant accuracy? *Journal of Marketing Research*, 49(4), 594–608.
- Johne, A and R Davies (2000). Innovation in medium-sized insurance companies: How marketing adds value. *International Journal of Bank Marketing*, 18, 6–14.
- Joyce, P, C Seaman and A Woods (1994). The economic growth implications of control and innovation strategies in small businesses. London Central Training and Enterprise Council.
- Kafourous, IM (2008). Economic Returns to Industrial Research. *Journal of Business Research*, 61, 868–876.
- Kamien, MI and NL Schwartz (1975). Market structure and innovation: A survey. *Journal of Economic Literature*, 13(1), 1–37.
- Kanter, RM (1985). Supporting innovation and venture development in established companies. *Journal of Business Venturing*, 1(1), 47–60.
- Katsoulacos, YS (1984). Product innovation and employment, *European Economic Review*, 26, 83–108.
- Keeble, D (1992). Small firm creation, innovation and growth and the urban–rural shift. Working Paper 52 Technovation Vol. 18 No. 1 No. 24, Small Business Research Centre, University of Cambridge, September.
- Keeble, D and S Walker (1993). *New Firm Formation and Small Business Growth in the United Kingdom: Spatial and Temporal Variations and Determinants*. Research Series No. 15, Cambridge, Department of Geography and Small Business Research Centre, University of Cambridge.
- Keeble, D, P Tyler, G Broom and J Lewis (1992). *Business Success in the Countryside, the Performance of Rural Enterprise*. London: HMSO, Department of the Environment.
- Khazanchi, S, MW Lewis and K Boyer (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*, 25(4), 871–884.
- Kline, SJ and N Rosenberg (1986). An overview of innovation. In *The Positive Sum Strategy*, R Landau and N Rosenberg (eds.), pp. 275–305 (Washington DC: National Academy Press).
- König, H, G Licht and H Buscher (1995). Employment, investment and innovation at the firm level, In *The OECD Jobs Study – Investment, Productivity and Employment*, OECD (ed.), pp. 67–81, Paris.
- Lachenmaier, S and H Rottmann (2011). Effects of innovation on employment: A dynamic panel analysis. *International Journal of Industrial Organization*, 29, 210–220.
- Laforet, S and J Tann (2006). Innovative characteristics of small manufacturing firms. *Journal of Small Business and Enterprise Development*, 13(3), 363–380.
- Lawton-Smith, H, K Dickson and S Lloyd Smith (1991). There are two sides to every story: Innovation and collaboration within networks of large and small firms. *Research Policy*, 20, 457–468.

- Lee, GL and IK Oakes (1995). Impact of process innovation on supply chain relationships, some smaller firm perspectives. *Proc. European Conf. Management of Technology*, Aston, University, Birmingham, pp. 413–426.
- Leiponen, A (2005). Skills and innovation. *International Journal of Industrial Organization*, 23(5–6), 303–323.
- Lorenzen, M (2001). Localized learning and policy: Academic advice on enhancing regional competitiveness through learning. *European Planning Studies*, 9, 163–185.
- Love, J and S Roper (2013). SME innovation, exporting and growth. ERC White Paper No.5. Available at http://www.enterpriseresearch.ac.uk/wp-content/uploads/2013/12/ERC-White-Paper-No_5-Innovation-final.pdf (accessed on 7 May 2015).
- Lu, J and P Beamish (2001). Internationalization and performance of SMEs. *Strategic Management Journal*, 22(6/7), 565–586.
- Lundvall, BA (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter.
- Lundvall, BA and S Borrás (1999). *The Globalising Learning Economy: Implications for Innovation Policy*. Office for Official Publications of the European Communities, Luxembourg.
- Maskell, P, H Eskelinen, I Hannibalsson, A Malmberg and E Vatne (1998). *Competitiveness, Localised Learning and Regional Development. Specialization and Prosperity in Small Open Economies*. Routledge, London.
- Moore, B (1993). Financial constraints to the growth and development of small high technology firms. Small Business Research Centre, Cambridge University (mimeo).
- Nyhan, B and G Attwell (2000). Towards the learning region: Education and regional innovation in the European Union and the United States. Luxembourg: Office for Official Publications of the European Communities.
- Oakey, R (1990). Problems of sustaining growth in established small high-tech firms. In *Symp. Growth and Development of Small High-Technology Business*, Cranfield.
- OECD and Eurostat (2005). *Oslo Manual - Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, 3rd Edition. Paris.
- Oke, A, G Burke and A Myers (2007). Innovation types and performance in growing UK SMEs. *International Journal of Operations and Production Management*, 27(7), 735–753.
- Pavitt, K and S Wald (1971). *The Conditions for Success in Technological Innovation*, Paris: OECD.
- Pavitt, K, M Robson and J Townsend (1987). The size distribution of innovating firms in the UK: 1945–1983. *Journal of Industrial Economics*, 55, 291–316.
- Peters, B (2008). *Innovation and Firm Performance. An Empirical Investigation for German Firms*, ZEW Economic Studies, 38. Heidelberg: Physica.
- Peters, B, R Riley and I Siedschlag (2013). The influence of technological and non-technological innovation on employment growth in european service firms. Service gap Discussion Paper No. 40, Mannheim.
- Piergiovanni, R, E Santarelli and M Vivarelli (1997). From which source do small firms derive their innovative inputs? Some evidence from Italian industry. *Review of Industrial Organization*, 12, 243–258.

- Podsakoff, PM, SB MacKenzie and NP Podsakoff (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569.
- Porter, M (2000). Location, competition and local economic development: Local clusters in a global economy. *Economic Development Quarterly*, 14(1), 15–34.
- Pratali, P (2003). Strategic management of technological innovations in the small to medium enterprise. *European Journal of Innovation Management*, 6, 18–31.
- Pratten, C (1991). *The Competitiveness of Small Firms*. London: Cambridge University Press.
- Robbins, DK, LJ Pantuosco, DF Parker and BK Fuller (2000). An empirical assessment of the contribution of small business employment to US state economic performance. *Small Business Economics*, 15(4), 293–302.
- Rothwell, R (1991). External networking and innovation in small and medium-sized manufacturing firms in Europe. *Technovation*, 11(2), 93–112.
- Rothwell, R (1992). Successful industrial innovation: critical success factors for the 1990s. *R&D Management*, 23(2), 221–240.
- Rothwell, R and W Zegveld (1986). *Innovation and the Small and Medium Sized Firm*. London: Francis Pinter.
- Salavou, H, G Baltas and S Lioukas (2004). Organisational innovation in SMEs: The importance of strategic orientation and competitive structure. *European Journal of Marketing*, 38, 1091–1112.
- Sauser, WI Jr (2005). Starting your own business? Prepare for success. *SAM Management in Practice*, 3(1), 1–4.
- SBRC (Small Business Research Centre) (1992). The state of British enterprise: Growth, innovation and competitive advantage in small and medium sized firms. SBRC, University of Cambridge.
- Schmidt, T and C Rammer (2007). Non-technological and technological innovation: Strange Bedfellows? Discussion Paper No. 07–052. Available at <http://ftp.zew.de/pub/zew-docs/dp/dp07052.pdf> (accessed on 7 May 2015).
- Schumpeter, J (1934). *The Theory of Economic Development*. Cambridge, Mass: Harvard University Press.
- Schumpeter, J (1939). *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, Vol. 2. New York: McGraw-Hill.
- Shelton, R and D Percival (2013). Breakthrough innovation and growth-PWC Available at http://www.pwc.ch/user_content/editor/files/publ_adv/pwc_breakthrough_innovation_and_growth_e.pdf (accessed on 7 May 2015).
- Simmie, J (1997). *Innovation, Networks and Learning Regions?* Regional Studies Association, Regional Policy and Development Series.
- Simon, M, B Elango, S Houghton and S Savelli (2002). The successful product pioneer: Maintaining commitment while adapting to change. *Journal of Small Business Management*, 40(3), 187–203.
- Slater, SF and JC Narver (1995). Market orientation and the learning organisation. *Journal of Marketing*, 59, 63–74.
- Smallbone, D, F Welter, A Voytovich and I Egorov (2010). Government and entrepreneurship in transition economies: The case of small firms in business services in Ukraine. *Service Industries Journal*, 30(5), 655–670.

- Smolny, W (2002). Employment adjustment at the firm level. A theoretical model and an empirical investigation for West German manufacturing firms. *Labour*, 16, 65–88.
- Stanworth, J and C Gray (1991). *Bolton 20 Years On: The Small Firm in the 1990s*. London: Paul Chapman.
- Stoneman, P (1983). *The Economic Analysis of Technological Change*, New York: Oxford University Press.
- Storey, D (1993). Should we abandon support to startup businesses? In *Small Firms, Recession and Recovery*, F Chittenden, M Robertson and D Watkins (eds.), Paul Chapman, London: Institute for Small Business Affairs.
- Tarry, SE (2000). Innovation in the administration of public airports. Grant Report March 2000, The PricewaterhouseCoopers Endowment for the Business of Government, Arlington (2000) in Halpern N. (2010) Marketing innovation: Sources, capabilities and consequences at airports in Europe's peripheral areas. *Journal of Air Transport Management*, 16(2), 52–58.
- Tidd, JJ, K Bessant and Pavitt (2001). *Managing Innovation: Integrating Technological, Market and Organizational Change*, 2nd Edition. Chichester: Wiley.
- Tohidi, H (2011). Review the benefits of using value engineering in information technology project management. *Procedia-Computer Science Journal*, 3(1), 917–924.
- Tohidi, H and MM Jabbari (2011). The main requirements to implement an electronic city. *Procedia-Computer Science Journal*, Elsevier, USA.
- Tohidi, H, AA Afshar and A Jafari (2010). Using balanced scored card in educational organizations. *Procedia - Social and Behavioral Sciences*, Elsevier, May, USA.
- Tonge, R, P Larsen and M Roberts (2000). Information systems investment within high-growth medium-sized enterprises. *Management Decision*, 38(7), 489–502.
- Trott, P (1998). *Innovation Management and New Product Development*, London: Financial Times Publishing.
- Tsvetkova, A, JC Thill and D Strumsky (2014). Metropolitan innovation, firm size, and business survival in a high-tech industry. *Small Business Economics*, 43(3), 661–676.
- Turock, A (2001). Strategic innovations. *Executive Excellence*, 19, 9–10.
- Van Reenen, J (1997). Employment and technological innovation: Evidence from U.K. manufacturing firms. *Journal of Labor Economics*, 15, 255–284.
- Vivarelli, M (2012). Innovation, employment and skills in advanced and developing countries: A survey of the literature. IZA Discussion Papers 6291.
- Von Tunzelmann, N (1995). Technology and industrial progress: The foundations of economic growth. Cheltenham: Edward Elgar.
- Vuong, QH, NK Napier and TD Tran (2013). A categorical data analysis on relationships between culture, creativity and business stage: The case of Vietnam. *International Journal of Transitions and Innovation Systems*, 3(1), 4–24.
- Wagner, E and E Hansen (2005). Innovation in large versus small companies: insights from the US wood products industry. *Management Decision*, 42(6), 837–850.
- Yasuda, T (2005). Firm growth, size, age and behaviour in Japanese manufacturing. *Small Business Economics*, 24(1), 1–15.