




SME innovation, exporting and growth: A review of existing evidence

International Small Business Journal
2015, Vol. 33(1) 28–48
© The Author(s) 2015
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0266242614550190
isb.sagepub.com


James H Love and Stephen Roper

Enterprise Research Centre and Warwick Business School, UK

Abstract

This article summarises and synthesises the evidence on SME innovation, exporting and growth, paying particular attention to internal and external (eco-system) enablers, and for the interplay between innovation and exporting in SME growth. We highlight those areas for which the evidence base is secure and where the evidence base remains limited, and develop policy suggestions and an agenda for further research.

Keywords

business growth, exporting, innovation, SME

Introduction

The increasing globalisation of markets and strengthening of global value chains both emphasise the importance of export competitiveness (Harris and Moffatt, 2011). For small- and medium-sized enterprises (SMEs), however, there is a strong positive relationship between exporting and growth and between exporting and innovation activity (Golovko and Valentini, 2011). Indeed, the evidence (see below) suggests that SMEs which have prior innovation experience are more likely to export, more likely to export successfully and more likely to generate growth from exporting than non-innovating firms. European SMEs that export grow more than twice as fast as those that do not, while internationally active SMEs are three times more likely to introduce products or services that are new to their sector than those which are entirely domestic in orientation (European Commission, 2010). Because exporters and innovative firms also tend to have higher productivity growth, the process of exporting and innovating which reinforces the growth of these firms also supports productivity growth – the ‘batting average’ effect (Department for Business, Innovation

Corresponding author:

Stephen Roper, Enterprise Research Centre, Warwick Business School, University of Warwick, Coventry CV4 7AL, UK.

Email: stephen.roper@wbs.ac.uk

& Skills (BIS), 2011). There is therefore, a potential rationale for policy interest in exporting and innovation at the firm level.

In this article, we summarise the current state of knowledge regarding the enablers of SME innovation and exporting. We also consider evidence on the interaction of SME innovation and exporting and the policy implications arising from this. The European Union internationalisation survey (European Commission, 2010) suggests that, for the sample as a whole, approximately half of internationally active SMEs also innovated. Since around one-quarter of the sample exported, this suggests that the majority of SMEs neither export nor innovate,¹ and very few do both, a fact that should be borne in mind in this review. Before assessing the evidence on the enablers of SME innovation and exporting, it is worth clarifying what we mean by ‘innovation’.² Our perspective here is deliberately broad, embracing both the technological and non-technological dimensions of innovative activity as well as the potential for both radical and incremental changes.³ The term ‘exporting’ is used in its normal sense of outward international trade in goods and/or services, conducted either directly or through a third party (such as a sales agent). Apart from being important in its own right, exporting is often the initial stage in the internationalisation process for SMEs (Jones, 2001).

We divide our discussion of the evidence based on the enablers of SME innovation and exports into three main sections. Section One, ‘Internal enablers of innovation and exporting’ focuses on the internal enablers, that is, those capabilities of individual SMEs which have been linked most strongly to innovation and export success. Section Two, ‘External enablers of innovation and exporting’ focuses on the external enablers, those elements of the operating environment which may either enable or hinder innovation and export performance. Section Three, ‘Innovation, exporting and SME performance’ focuses on the rather complex and dynamic links between innovation, exporting and business growth. Finally, the ‘Conclusion: research agenda and policy implications’ considers some policy implications and areas for further research.

Internal enablers of innovation and exporting

The contribution of SMEs to innovation and technological development is often emphasised, with examples such as Silicon Valley often cited as hotbeds of small business innovation (Audretsch, 2002; Bresnahan and Gambardella, 2004). The strengths and weaknesses of SMEs in terms of innovation and exporting have also been widely discussed; typically, smaller firms are said to have advantages in terms of rapid decision-making, willingness to take risks and flexibility in responding to new market opportunities; in contrast, larger firms have advantages linked to scale and the availability of specialist resources. This suggests that ‘the relative strengths of large business are predominantly material (economies of scale and scope, financial and technological resources, etc.), while those of small firms are mostly behavioral (entrepreneurial dynamism, flexibility, efficiency, proximity to the market, motivation)’ (Vossen, 1998: 90).

In this section, we review the evidence on the internal enablers of SME innovation and exporting – skills, finance, research and development (R&D), and so on. A key theme which emerges is the resource-constrained nature of many small firms and therefore, their dependence on the broader eco-system with in which they are located. The availability and accessibility of these external resources are the focus of section ‘External enablers of innovation and exporting’.

Skills, leadership and people management

The extant evidence provides considerable evidence for the direct contribution of workforce, managerial and marketing skills to innovation and exporting, although the literature on SMEs

specifically is relatively limited (Brambilla et al., 2012; Freel, 2005; Knight and Kim, 2009; Leiponen, 2005). Analyses (Herrmann and Peine, 2011) of national competitiveness suggest a broad agreement that firms require distinctly different skill sets to pursue different market strategies. Different skill needs are also evident for firms adopting different exporting strategies; one recent study noted that firms exporting to competitive, high-income countries employed more skilled workers (Brambilla et al., 2012). The skills needed for innovation and exporting also differ at different stages of the value chain; for example, technical staff or creative staff may play a key role in the early, developmental stages of an innovation project, but marketing staff are likely to be more important in terms of commercialisation (Herrmann and Peine, 2011). There is also evidence that the managerial skills needed for entering export markets is different from that required for succeeding in export markets. Commercial and managerial experience help firms become exporters, but once over the exporting hurdle, it is the level of managerial education, rather than experience, that has a substantially positive effect (Ganotakis and Love, 2012a). Varying skill needs are reflected in the need for ambidextrous leadership which moves from transformational leadership towards more focussed transactional leadership as innovation projects move closer to market (Rosing et al., 2011). Business leaders also have a crucial role in ensuring effective employee engagement in innovation and exporting. There is suggestive evidence that effective people management and team development and management can play a significant part in ensuring the success of both innovation and exporting projects and so contribute positively to SME success (McCloud and Clarke, 2009).

Globalising markets and increasingly open models of innovation therefore, pose significant skills and people management challenges for smaller firms. This, in turn, emphasises the importance for SME innovation of the national 'skills ecosystem' and related legal, vocational education and industrial relations systems (Cooney, 2010). Partnering or collaborative working for innovation or exporting, however, also offers SMEs a potential route for accessing external skills and so overcoming internal skill constraints (Jones and Craven, 2001). Maintaining and developing collaborative relationships also has significant skills and people management implications, however, and one recent study of technology transfer centres in Italy identifies the importance of the combination of technical skills and networking competences as well as relevant relational capital (Comacchio et al., 2012).

R&D

In-house R&D plays a crucial role in a firm's ability to generate new knowledge which may provide the basis for proprietary intellectual property (IP) and innovation (Blackburn, 2003; Griffith et al., 2003). In broadly based studies of the determinants of innovation, R&D capability is almost always strongly and positively linked to innovation outputs, a relationship which is stronger in research-intensive industries (Crepon et al., 1998; Love et al., 2009; Roper et al., 2008). Even in low-tech manufacturing and service sectors, where R&D might be thought to be less important, the evidence suggests positive R&D–innovation relationships. Two main mechanisms are thought to be important in this relationship: first, R&D may create new knowledge which provides the basis for innovation and second, skilled R&D staff may increase absorptive capacity, that is, the ability to assess, access and absorb external knowledge (Griffith et al., 2003).

In larger firms, R&D may be formally organised in a specific department or unit. In the majority of smaller firms, reflecting the nature of innovation activity itself, R&D activity – where it takes place – is more often informal, ad hoc and opportunistic (Blackburn, 2003; Griffith et al., 2003). R&D in SMEs is also less likely to be a specialist function than in larger firms, with development work often being undertaken by skilled employees or senior management (Freel, 2005).

One implication – strongly supported by the empirical evidence – is that innovation in smaller firms is less dependent on internal R&D than that in larger firms and more dependent on external knowledge obtained either through partnerships or spillovers (Ganotakis and Love, 2011; Piergiovanni et al., 1997).

Evidence on the direct relationship between R&D and exporting is less clear, and

a number of studies have found an insignificant relationship between R&D investment and export intensity. This leads to the suggestion that what really matters for exporting is innovation (both product and process) rather than R&D, because the ability to compete in international markets is ultimately influenced by the firm's capacity to compete internationally, rather than its investment in research activity. This may be especially true for SMEs, where formal R&D measures markedly under-report their research activity and degree of innovativeness. (Ganotakis and Love, 2011: 283)

Nevertheless, research pertaining to UK firms does suggest that R&D, innovation and exporting are mutually reinforcing (Harris and Moffatt, 2011).

Capital investment and equipment

Recent macro-economic evidence suggests a positive link between a nation's fixed capital investment and export market performance (Seo et al., 2012). At the level of the individual enterprise, notions of embodied technical change, through which firms update their technologies through fixed capital investment, have a long history. Indeed, such purchases may be another way in which innovative SMEs overcome internal resource limitations. One study of young innovative Italian SMEs, for example, found that purchases of machinery and equipment were the crucial driver of innovative outputs (Pellegrino et al., 2009). Acquiring such capital does, of course, depend on the accessibility of investment finance which may be a particular issue for young innovative SMEs, particularly where such firms are also seeking to export. In Canada, for example, there is some evidence that SMEs which were growth oriented and which were seeking to export had a particularly high rejection rate when seeking external finance (Riding et al., 2012).

Internal financing

Small firms face particular problems in accessing external finance for innovation and export development (Ughetto, 2008). The standard issues of viability and legitimacy associated with smaller firms are exacerbated by the commercial and technical risk associated with their innovation and/or export project. In the early stages of development – exploration of market potential, product or service development – this mix of uncertainty and risk may make it particularly difficult for firms to present a robust case to potential finance providers, leading to significant refusal rates (Riding et al., 2012). Developing a robust business case may become more feasible, however, once the initial risks are overcome and the focus moves to the establishment of operations, market introduction, and so on. Even here, however, commercial risks are likely to be significant, particularly in situations where export operations or innovation is unprotected either by strategic or legal frameworks. This is likely to place increased emphasis on the internal financing of such projects.

A number of studies (e.g. Riding et al., 2012; Shaver, 2011; Ughetto, 2008) have considered the role of internal financing on expenditure on R&D, generally identifying positive relationships between cash-flow, liquidity and R&D investment. It is also suggested that internal funding is more important for innovation in smaller firms than for larger companies – perhaps reflecting

stronger external market constraints on the former (Ughetto, 2008). Essentially similar findings are evident for exporting: financial constraints can act as a barrier to smaller firms engaging in exporting (Bellone et al., 2010). Where there is evidence of market failure, this suggests the potential value of public intervention to help potential SME exporters and innovators overcome initial (sunk) entry/R&D costs and expand their range of products, services and markets.

Design

The importance of design as a contributor to innovation success has been emphasised due to the increasing design intensity of a wide range of products (Gemser and Leenders, 2001) and the ability of designers to enhance a product's functional, emotional and symbolic value (Verganti, 2009). Design-driven or design-led new product development processes may also contribute to the development of more radical innovations. Evidence from innovation surveys also suggests a positive linkage between design investment and innovation outputs in a range of contexts (Cereda et al., 2005; Love et al., 2011). Less comprehensive evidence exists on the links between design and export outcomes. There is some evidence that export results are stronger where firms orient their product design explicitly towards the needs of international customers (MacPherson, 2000). Indicative evidence also suggests that in supplier-dominated industries, investments in design and productive efficiency may have a stronger influence on export success than investments in internal R&D or external knowledge gathering (Flor and Oltra, 2005).

It has been suggested that SMEs may face particular behavioural, cultural and resource issues that reduce their ability or willingness to engage with design as part of their innovation activity (Berends et al., 2011) they may, for example, fail to understand the potential value of design for innovation success (Millward and Lewis, 2005). Alternatively, communication difficulties may mean they find it difficult to relate to designers and establish common objectives and aspirations (Goffin and Micheli, 2010). Smaller firms may also be less likely to have internal design resources and, therefore, be more dependent on external providers (Berends et al., 2011). Again, this emphasises the potential importance of SMEs operating environment for innovation, the availability of external design resources and the potential value of support measures which help SMEs to embed design practices (Design Council, 2012).

Intellectual property management

The role of patents, protected designs and copyright in innovation and exporting has been much discussed, and it is often suggested that SMEs may be disadvantaged in IP regimes due to the costs of IP registration and protection (Blackburn, 2003). It has also been suggested that as individual SMEs typically have fewer patents, and so on, they may be less able to adopt a technology-swapping mechanism to defend their IP rights than larger companies with a wider patent portfolio (Lanjouw and Schankerman, 2003). There is some evidence that larger patent holdings may also be more conducive to open innovation (Lichtenthaler, 2010). Levels of IP activity among SMEs also vary between regions and sectors; however, there is little consistent evidence of any clear association between IP activity and either SME growth or survival as Rogers et al. (2007) conclude:

These findings support the view that SMEs see value in registering their innovations to acquire IP protection ... the view that SMEs may be so financially disadvantaged, or lacking in information about IP assets, that they do not widely use these systems of protection is rejected by this study. (p. 41)

SME IP protection strategies differ from those of larger firms focussing more often on speed to market or secrecy rather than patenting (Lanjouw and Schankerman, 2003). One exception appears to be those firms working with universities – typically R&D-intensive or science-based small firms for which patents remain an important mechanism for appropriating the returns from innovation (Leiponen and Byma, 2009). For these firms, patents also provide an important signalling mechanism, attracting customers and enticing venture capital investments (Holgersson, 2013).

Leadership and strategy

While there has been considerable discussion about innovation strategy in the research literature (Clausen et al., 2012; Keupp et al., 2012), the current state of knowledge is characterised by ‘conflicting theoretical predictions, persisting knowledge gaps and theoretical inconsistencies’ (Keupp et al., 2012). Relatively few studies (Clausen et al., 2012) focus specifically on innovation strategy in SMEs, suggesting few areas of agreement in terms of the best innovation strategies. For example, while there is much discussion of ‘born global’ firms,⁴ there is evidence that for many SMEs exporting is an opportunistic and sporadic activity, rather than a strategic priority (Bonaccorsi, 1992; Crick, 2003; Love and Ganotakis, 2013; Welch and Welch, 2009). One area of strategy in which there is growing consensus, however, is the choice between closed and open innovation and the extent of SME external knowledge search. Here, the evidence (e.g. Vahter et al., 2013) points strongly towards the superiority of open models of innovation – particularly for SMEs – and in particular to innovation partnering along supply-chains. Such partnerships may help both to increase levels of innovation in the short term but also to help SMEs sustain their innovation success (Clausen et al., 2012).

The evidence also suggests that co-operative strategies help SMEs to enhance their knowledge about export markets and improve export performance (Haahti et al., 2005). Other strategic factors linked to export success have been an explicit exporting strategy, systematic planning and organising for exporting and strength in marketing and product/service quality (Wheeler et al., 2008). Research – based on Spanish data – captures a number of these factors and examines the complementarity between innovation and exporting as drivers of SME growth. The evidence provides strong support for the reinforcing impacts of innovation and exporting on growth and the potential for a virtuous circle in which innovation drives exports, and the external knowledge gained from export markets drives further innovation and growth (Golovko and Valentini, 2011).

The importance of leadership in shaping innovation outcomes and differences between the appropriate leadership styles for innovation in larger and smaller firms have been noted. In larger firms, there is positive evidence of the relationship between transformational leadership and organisational innovation (Garcia-Morales et al., 2012); however, such effects appear strongly moderated by organisational size. This suggests that innovation in smaller firms may benefit more from transactional leadership styles as SME leaders are able to monitor and reward employees more effectively (Vaccaro et al., 2012). In terms of exporting, the evidence also emphasises the role of management and leadership in success reflecting (1) favourable and supportive attitudes (including perceptions, motivations and commitment) to exporting and (2) the quality of managerial resources, including management education/background (Wheeler et al., 2008).

Internal enablers – summary

Considerable progress has been made over the last decade in our understanding of the internal enablers of innovation and exporting, although the evidence base for SMEs remains limited to

some degree. There are four main areas in which there is broadly based and consistent evidence. First, in terms of skills, it is clear that high-quality skills really matter for innovation and exporting, although different innovation/export strategies require very different skill sets. The importance of technical skills is also increasingly matched by the value of networking and team-working skills. Second, there is strong and consistent evidence of the positive relationship between R&D and innovation across all firm size bands and industries. This undoubtedly reflects both the knowledge creation and absorptive capacity effects of R&D. Third, although there are relatively few studies, there emerges a consistent and positive linkage between capital investments and innovation and export success. Finally, a similarly positive relationship exists between innovation and export activity and strong cash-flow and liquidity.

In a number of other areas, the evidence base – particularly for SMEs – remains either inconsistent or limited. In terms of the internal enablers of innovation and exporting, there are, at least, four areas in which the evidence remains limited. First, while the relationship between different skills indicators and firm-level performance outcomes is well understood, the role of people management and employee engagement is much less well explored. Second, while there is strong suggestive evidence of the value of design for innovation and exporting in general, there has been little rigorous analysis for SMEs. Very much the same could be said for the relationship between R&D and exporting. Third, the evidence both on the extent of IP management and its performance benefits remains limited. Finally, relatively little is known about the relationship between business strategy and planning and innovation and exporting success in SMEs.

External enablers of innovation and exporting

Earlier sections of this article have emphasised the extent to which the innovation and exporting activities of SMEs depend on external resources. This reflects changes in the nature of the processes under-pinning innovation as firms seek to adopt leaner, more rapid and more effective innovation strategies. This has led to the consideration of open, partnered or networked innovation where knowledge resources are pooled and innovation risks can be shared. For SMEs, open innovation provides a way of overcoming internal resource constraints which limit the scope of their innovation activities. Open innovation helps smaller firms share risk and match innovation resources flexibly to opportunistic or intermittent episodes of activity (Vahter et al., 2013; Van de Vrande et al., 2009). The potential for open innovation in SMEs is greatest, however, where SMEs are operating in strong industrial and innovation eco-systems where possible innovation partners are plentiful and easily accessible (Toedtling et al., 2011). In the research literature, this is reflected in discussions of regional innovation systems, innovative milieu and notions such as the triple helix (Braczyk et al., 1998; Leydesdorff and Etkowitz, 1998; Shefer and Frenkel, 1998).

In this section, we briefly review the evidence on the key external enablers of SME innovation and exporting. Two main categories of external enablers are considered: external factors or linkages which may enhance or augment the knowledge base of the SME and provide the basis for innovative or export development, and resource-enhancing or augmenting factors which may help SMEs to overcome internal resource constraints. This is followed by a brief review of demand-side drivers of SME innovation and exporting.

Knowledge enhancing or augmenting factors

Spatially specific drivers of innovation and exporting have been much discussed in the research literature in terms of industrial districts, industry clusters, innovative milieu and innovation systems

(e.g. Braczyk et al., 1998; Shefer and Frenkel, 1998). Contemporary literature distinguishes between interactive and non-interactive forms of learning, the former characterised by firms building strategic relationships with other firms and external knowledge creators and the latter characterised by a lack of reciprocal knowledge and/or resource transfer (Glückler, 2013). In the case of SMEs, we can distinguish (at least) three key channels through which firms may obtain external knowledge which can contribute to their innovation and exporting activity:

- ‘Being there’ in which firms benefit from un-priced, and perhaps unanticipated, flows of local knowledge or information mediated through social contacts or labour market linkages. Such effects – agglomeration economies – are likely to be more significant in stronger and better connected local industrial eco-systems and may be reinforced by local competition and selection effects (Combes et al., 2009).
- ‘Openness’ – partnering in which firms engage in deliberate relationships with other organisations in order to gather either technical knowledge or market understanding. Such relationships may vary widely in nature, be formal or informal, collaborative or contractual (Glückler, 2013).
- ‘Learning by exporting’ in which firms gain market – and also potentially innovation-related – knowledge through their exporting activities. Such learning is more likely to be more influential where exports go to knowledge-intensive or to highly competitive markets (Love and Ganotakis, 2013).

Knowledge gains from being there reflect the character of knowledge as a semi-public good with properties of non-rivalry (He and Wong, 2012). For SMEs, alternative locations offer different ranges of local knowledge. Evidence from Australia, for example, suggests that more urban locations may allow SMEs easier access to export-related infrastructure and networks and so contribute positively to export outcomes (Freeman et al., 2012). It has been noted that export performance ‘is strongly influenced by background variables from the local business environment’ (Stöttinger and Holzmüller, 2001: 23). Knowledge gains from being there may be augmented by the purposive development of linkages to outside sources of knowledge (Chesborough, 2003). Indeed, recent empirical evidence suggests that the prevalence of open innovation among SMEs has increased in recent years (Van de Vrande et al., 2009).

The degree of openness is not the only influence on innovation performance; the nature of that openness may also matter. For example, a study of around 1500 European SMEs finds that customers are often a source of innovation inputs (Brunswicker and Vanhaverbeke, 2011). Some types of innovation linkages – for example, with universities and research centres – may however, require greater expertise and absorptive capacity from the firm; small firms are more likely to lack these resources. Linkages with universities and researchers are also fraught with risks due to the uncertainty of any commercial applicability of research outcomes, while larger firms may be better equipped for leveraging these risks. Again, evidence is limited, but does suggest that supply-chain linkages (i.e. with customers and suppliers) are not only the most common forms of innovation linkage for smaller firms, but also have the largest positive effect on innovation performance (Vahter et al., 2013).

Evidence also suggests the value of diversity in terms of a firm’s portfolio of external alliances and that smaller firms benefit more from openness than larger firms (Vahter et al., 2013). There are also indications for strong sectoral and regional contrasts (Cui and O’Connor, 2012; Iammarino et al., 2012; Laursen and Salter, 2006). For example, there is some evidence that the benefits of openness may be weaker in services where some firms may not have developed the managerial routines to take advantage of external knowledge sources (Leiponen, 2012).

Purposive links may also help SMEs to overcome the information and set-up costs they face in entering foreign markets. This may be particularly important for SMEs which have limited internal knowledge and financial resources as exporters tend to be substantially better networked externally than non-exporters. Importantly too, external collaboration is positively associated with exporting, but the nature of this effect differs with firm size. Specifically, for large- and medium-sized firms, it is the existence of joint business operations that boosts exports, while for small firms it is business and trade association membership that matters, perhaps suggesting that information on foreign markets is a key issue for small enterprises (Tomiura, 2007). Studies from other countries find similar results; a study of South African manufacturing SMEs (Gumede, 2004) finds that greater access to information on export markets both encourages exports and is associated with increased export intensity, while having external business linkages encourages exporting. Another multi-country, firm-level study finds that foreign networks (financial, ownership and joint-venture) and having strong linkages with domestic chambers of commerce are both positively linked to being an exporter (Ricci and Trionfetti, 2012).

There is little agreement upon exactly which type of commercial linkages are most likely to produce knowledge useful to export performance; there is some evidence suggesting that supply-chain linkages (especially with suppliers) are most associated with improved export performance (Ibrahim and Ogunyemi, 2012). Alternatively, it has been found that non-supply-chain linkages are associated with an increased likelihood of exporting (Ganotakis and Love, 2011).

Resource-enhancing or augmenting factors

Collaborative arrangements, such as those discussed above, have an important role in easing resource constraints faced by smaller firms. Globally, however, governments have responded to such resource constraints by providing targeted support for individual innovation projects – often in the form of public sector grants or loans (Foreman-Peck, 2013; Hewitt-Dundas and Roper, 2009). There is considerable evidence of the positive additionality of public grant support for private R&D activity and subsequent positive effects on business (Griliches, 1995; Hewitt-Dundas and Roper, 2009; Mamuneas and Nadiri, 1996). This effect can operate through a number of different organisational mechanisms, however, including reducing the cost and risk of R&D to firms, contributing to developments in human resources, improving absorptive capacity, generating reputational or ‘halo’ effects and creating cost savings through collaborative R&D and the sharing of research results area (Freel, 2005; Trajtenberg, 2000; Veugelers and Cassiman, 1999). It is worth noting however, the historical bias in support for innovation towards technological or technical innovation. Non-technological innovation – important in both manufacturing and services – has been only weakly supported in the past, although there are some international examples of effective policy in this area (Freel, 2005; Trajtenberg, 2000; Veugelers and Cassiman, 1999).

Specifically with regard to SMEs in the United Kingdom, there is some evidence that public support for innovation is both effective and efficient. Findings from research using a sample of around 10,000 SMEs, employing propensity score matching as a counterfactual, found that SMEs with public support for innovation were significantly more likely to innovate and that innovators grew faster than non-innovators (Foreman-Peck, 2013). The same study also finds that SME tax credits were relatively expensive compared with earlier support instruments (e.g. SMART and SPUR).

In terms of exports, public support typically aims to help firms overcome information asymmetries or the costs of entering export markets. Here, one of the key roles for government can be in acting as a ‘trusted intermediary, bridging gaps in private-sector networks in ways that could not be done as effectively, if at all, by a commercial service provider’ (BIS, 2010: 86). Evidence for the United

Kingdom suggests that export services provided by UK Trade and Investment (UKTI) do have a positive effect on overcoming these barriers (Driffield et al., 2010). Specifically, three principal benefits of UKTI support have been supported by evaluation evidence. First, it has a substantial positive impact on the profit and medium-term performance of supported firms, linked to stronger business growth. Second – and linking back to the connection between exporting and innovation – public support has a substantial positive impact on business R&D and innovation. This suggests lasting positive effects upon business competitiveness in both domestic and overseas markets (Driffield et al., 2010). Third, public support can have a direct and substantial positive impact on business skills and export know how (BIS, 2011), helping to relieve the internal resource constraints experienced by SMEs. It should be noted that these evaluations of UKTI support are based on (largely) econometric studies undertaken on behalf of UKTI rather than on articles in peer-reviewed academic journals.

Demand-side effects on innovation and exporting

The external knowledge-enhancing and resource-enhancing effects considered above operate primarily through the supply-side. The demand-side – whether from consumers, intermediate demand from other companies or the public sector – also has an important role in shaping innovation and export performance (Mowery and Rosenberg, 1979). Two elements of the demand for innovations in any market have been emphasised: the speed at which firms, consumers and the public sector adopt new innovations, and the lead role of customers in articulating a demand for innovations (Allman et al., 2011). The demand-side influences on export growth have also been widely discussed with an emphasis on market growth, average incomes in importing countries, logistics and exchange rate stability (Eckaus, 2008).

External enablers – summary

As with the internal drivers of innovation and exports, significant progress has been made in recent years in our understanding of the external drivers of innovation and exporting. Strategic debates about open innovation and partnering have focussed attention on firm innovation and knowledge-gathering strategies, while more policy-oriented discussions have explored the potential impact of changes in framework conditions and business eco-systems. All told, the evidence suggests that external factors can have a significant effect on the innovative and export success of SMEs. The scale and size of these effects depend crucially however, on ambition and capability to take advantage of the available external resources.

There are five notable areas in which the evidence is consistent. First, purposive links formed between SMEs and their development partners – openness – can play a positive role in innovation and export growth. Second, such links are likely to be more positive in stronger eco-systems and where SMEs have greater absorptive capacity. Third, there is considerable evidence that targeted public support for innovation and exporting can yield significant additionality. Fourth, demand-side factors can provide an important stimulus to both innovation and exporting, although some studies have raised questions about the scale and sophistication of demand for innovative products from UK firms, consumers and government. Finally, the evidence emphasises the positive role of consumer or user-led innovation, and the potential catalytic role of public procurement, in stimulating SME development.

These ‘knowns’ are balanced by a series of less-well-understood elements of the external drivers of innovation and exporting. First, while it is clear that place matters for both innovation and exporting, relatively little is known about the mechanisms through which the gains from being there operate, particularly for SMEs. Second, it remains unclear which eco-system characteristics

are more important in influencing innovation and export success. In part, both of these issues relate to a problem of measurement and the difficulties associated with characterising the strength of the eco-system within which firms operate. Third, it is unclear which types of purposive linkages have the greatest benefits, particularly in terms of supporting export development. Fourth, there is some uncertainty about the importance of learning by exporting, particularly where exporting is an irregular rather than sustained activity.

Innovation, exporting and SME performance

This section summarises the key points of an encompassing literature, highlighting those econometric studies which are most relevant with regard to SMEs and in which the evidence appears most convincing. It does not aim to be a comprehensive summary of the literature on innovation, exporting and performance: more detailed and general literature reviews are highlighted in the text where appropriate.

Innovation and performance

Innovation has long been recognised as a key element of competition and dynamic efficiency of markets (Hall et al., 2009). Innovators (product, process and organisational) should take market share from non-innovators and grow at their expense, until such time as their market position is undermined first, by imitations of new products and processes, and then, by yet newer products. In the long run, therefore, innovators will grow faster, be more efficient and ultimately be more profitable than non-innovators (Crepon et al., 1998). There is a wealth of evidence indicating a positive relationship between innovation and firm performance in both manufacturing and services. Many of these studies use some form of production function approach relating innovation (inputs or outputs) to some aspect of performance, generally productivity (Roper et al., 2008). Some studies find clear evidence of a positive relationship between both product and process innovation and productivity (Hall et al., 2009), while others find a positive association between innovation and growth (in employment and/or sales) (Freel, 2004; Ganotakis and Love, 2012b; Oke et al., 2007).

Evidence specifically for SMEs is more limited, often characterised by small sample sizes and relatively simplistic econometric analysis. So, for example, SME analyses typically fail to address issues such as the simultaneous relationship between innovation and performance or issues of self-selection (e.g. better performing firms choose to innovate, rather than innovation improving performance). The failure of much of the SME literature to allow for the interdependence of innovation and firm performance is likely to be significant. Accordingly, research exploring Italian firms strongly suggests a two-way relationship: innovative firms outperform non-innovators, but better performing firms are also more likely to innovate and to devote much of their resources to innovation (Cainelli et al., 2006).

Exporting and performance

There are convincing reasons to expect exporters to be more productive than non-exporters: it may be that highly productive firms are more likely to become exporters (i.e. self-selection) and/or because exporting makes firms more productive. These two scenarios are not mutually exclusive, but from a public policy perspective, it is important to know whether either or both are enacted in practice. Economy-based research on exporting begins with the recognition that there are fixed costs involved in entering export markets, and therefore, market entry is easier for more productive firms (Helpman et al., 2004). The rationale is that firms contemplating entry to foreign markets

have to engage in market research, set up new distribution networks, negotiate with potential new partners and may have to modify their product range, all of which incur costs. Only those with sufficiently low marginal costs have the profits large enough to cover these fixed costs of entry. Thus, exporters are more productive than non-exporters; not specifically because of benefits derived from exporting, but because they are more productive firms at the onset and can, therefore, overcome the fixed costs of entering foreign markets. This is the self-selection hypothesis, strongly supported by the empirical evidence (Wagner, 2007).

The second possibility is that productivity improves as a result of exporting activity. Support for this argument is threefold; first, the stronger competition in foreign markets forces firms to improve both products and processes and thus remain competitive. Second, there is the possibility of 'learning by exporting', principally involving being exposed to superior foreign knowledge and technology which also helps to boost the productivity of exporting firms. Finally, scale effect may be important. Exporting extends the market over which margins may be earned, and since many costs, such as R&D, are largely fixed, such investments may be recouped over a larger sales volume.

Evidence for all firms on the productivity benefits from exporting is somewhat mixed; there is some indication that entry into exporting results in productivity benefits, while others fail to find any effects (Ganotakis and Love, 2011). Interestingly, evidence from the Taiwanese electronics industry suggests that exporting significantly boosts productivity, especially if accompanied by investment in R&D and/or labour training (Aw et al., 2007).

Evidence focussed specifically on SMEs is again somewhat variable and uses a number of measures of performance. Thus, a study of 164 Japanese SMEs (i.e. less than 500 employees) found a positive association between exporting and (lagged) sales and asset growth, but a U-shaped relationship between exporting and productivity (Beamish and Lu, 2006). Perhaps the most sophisticated research is on 14,000 manufacturing SMEs from Sweden over the period 1997–2006 (Eliasson et al., 2012). Using propensity score matching, this study finds evidence that first, small firms self-select into export markets on the basis of productivity, second, export-entrants increase productivity relative to other firms shortly before entry, possibly via higher investment in physical capital and third, the productivity gap between export-entrants and non-exporters does not continue to grow after market entry. In other words, small firms learn *to* export, but do not exhibit learning *by* exporting. However, evidence from Spanish SMEs suggests there may be another benefit arising from exporting: survival-by-exporting (Esteve-Perez et al., 2008). Specifically, exporting SMEs have a significantly lower likelihood of failure than non-exporters. This effect remains significant even after controlling for variables capturing some of the benefits commonly attributed to learning-by-exporting, such as firm productivity and innovative outcomes.

Innovation and exporting

Traditionally, economic approaches to export performance have viewed competitive advantage as being based on factor endowments or the quality of products or services (Wheeler et al., 2008). In both of these approaches, the implied (positive) link runs from R&D/innovation to exporting. By contrast, endogenous growth models recognise the possibility of the effect running from exporting to innovation (Grossman and Helpman, 1991). The channels for this are similar to those summarised in the last section: competition from foreign sources, learning-by-exporting and scale effects.

There is a considerable empirical literature suggesting a positive link between innovation and exporting, and a rather smaller one suggesting the reverse effect (i.e. exporting fosters innovation) (Ganotakis and Love, 2011; Harris and Li, 2009, 2010). In terms of SMEs, a survey of 9480

SMEs in 33 European countries in 2009 found a strong positive association between internationalisation (including exporting) and innovation, but did not analyse the nature of this relationship (European Commission, 2010). Possibly, the most relevant research is on 1400 Spanish SMEs over a 10-year period, which specifically seeks to assess whether innovation and exporting are complementary for sales growth (Golovko and Valentini, 2011). This study suggests that complementarity does indeed exist – indeed, only SMEs that both innovate and export generate significantly greater sales growth: simply doing either exporting or innovation is not enough. Data from the same Spanish study conclude that the strong positive association between exporting and productivity is largely moderated through (product) innovation; in other words, once previous innovation performance is allowed for, the positive association between exporting and productivity is weakened, but is still present (Cassiman et al., 2010). A similar conclusion regarding the complementarity of exporting and innovation arises from a study of service-sector firms in Northern Ireland (Love et al., 2010).

Innovation, exporting and performance – summary

There is a substantial body of economic evidence on links between innovation, exporting and performance at the firm level. Specifically, there is general agreement on three key outcomes: first, there is a strong positive association between innovation, exporting and performance in terms of productivity and/or growth. This is consistent across countries and time periods. Second, innovation and exporting appear to work jointly to improve performance. Innovation without access to foreign markets does not seem to provide substantial performance benefits (e.g. Love et al., 2010). Third, there is also a substantial element of interdependence and self-selection in this process (Ganotakis and Love, 2011). Thus, productive, well-run firms tend to both innovate and export, but even when the self-selection issue is recognised, there are performance benefits from innovation and exporting.

There are nevertheless, important areas in which our knowledge is incomplete. Perhaps most importantly, the extent to which the innovation–exporting–performance relationship involves self-selection is unclear for SMEs. Such firms tend to innovate and export less, but it is unclear whether the mutually reinforcing relationship between them is stronger or weaker for smaller rather than larger firms. The principal reason for this appears to be the lack of extensive panel datasets for SME performance. By contrast, much SME research still relies on cross-sectional data, which may provide detailed information on firm characteristics, but which limits the ability to draw conclusions on causality. The work of Eliasson et al. (2012) reviewed above is an important exception.

In addition, information on different types of innovation and their effects is limited; specifically, we know relatively little about the effects of organisational innovation, for example. And, given that some SMEs are intermittent exporters, more information is required on whether persistence in exporting has performance implications for smaller firms, as well as the differential performance implications of born globals. Finally, there is the issue of what the key performance measure resulting from innovation and exporting ought to be. Following the theoretical literature, productivity is the key issue in most econometric studies, but (sales) growth may also be important in the SME context.

Conclusion: research agenda and policy implications

Based on the evidence reviewed, a summary of the main areas of agreement and contention in terms of SME innovation and exporting is provided in Table 1. This also forms the basis for some generalised policy recommendations where the evidence is clear and a potential research agenda for those areas in which there is limited or contentious evidence. Evidence on the internal drivers of innovation and exporting reinforces the importance of a number of policy agendas around skills

upgrading and support for investment in R&D, design and capital equipment. In terms of skills, for example, evidence (e.g. Freel, 2005; Ganotakis and Love, 2012a; Leiponen, 2005) of the value of high-level skills for SME innovation and exporting emphasises the importance of measures such as supporting the development of tailored apprenticeship programmes which can help with a firm's specific innovation and export strategy. Similarly, measures in the United Kingdom such as the Innovation Vouchers, Smart Awards and Knowledge Transfer Partnerships, and the Design Leadership Programme have proven effective in supporting SME innovation (Design Council, 2012; Driffield et al., 2010; Jones and Craven, 2001).

Measures to promote access to finance also have an important role by increasing SME liquidity and cash-flow, leaving more scope for investment in innovation and export development. Such measures are likely to be most valuable however, when improved access to finance is accompanied by specialist advice or mentoring related to innovation or export development. Measures such as the Growth Accelerator in the United Kingdom adopt this approach combining mentoring with support for management and leadership development. Strong evidence (e.g. Freel, 2005; Leiponen, 2005) also exists on the value of skills development and R&D for SME innovation and exporting. There is more limited evidence for SMEs – and therefore, a less robust evidence base on which to base policy – for some aspects of intangible investment (such as design and IP management), and some aspects of people management and engagement, and more empirical work would be welcome here. Further research is also needed to clarify the effects of SME ownership characteristics, strategy and diversity on innovation and export success.

Alongside the internal enablers of innovation and exporting, our review also emphasises the potential importance of the external enablers of innovation and exports, emphasising the importance of the eco-system within which SMEs operate. Such eco-systems, including both private and public institutions, may either be enabling or hindering in the resources they offer to SMEs at different points in their strategic development. Market failures may be important here; however, system failures related to interaction or connectivity deficits may also be constraints on performance, providing a potential rationale for policy intervention (Asheim et al., 2007; Organisation for Economic Co-operation and Development (OECD), 1999). This type of thinking is evident both in the 2013 Witty Report in the United Kingdom, which emphasised the potential role of universities as lead bodies within local and industry eco-systems, but also in a series of other UK policy reports from both sides of the political spectrum which have emphasised the local dimension of economic policy and enterprise development (e.g. Adonis, 2014; Heseltine, 2013; Young, 2014).

In terms of SME innovation and exporting, our understanding of the impact of different eco-system components remains incomplete. One review, focussed on the UK eco-system for innovation, identified five relatively strong aspects – the public research base, competition and entrepreneurial activity, human capital and infrastructure and services (Allman et al., 2011). Two other aspects of the environment provided more concern. First, on the basis of data from the World Economic Forum (WEF) Global Competitiveness Report, the availability of finance in the United Kingdom was described as 'moderate to poor' by international standards. There is also some more specific evidence from Canada which suggests that SMEs seeking to innovate and/or export are likely to experience higher rejection rates when applying for loan finance (Riding et al., 2012). Evidence on this point is limited in the United Kingdom. The international evidence suggests, however, that general measures to promote liquidity in SMEs remain important for innovation and exporting, and also that more specifically targeted initiatives to make these activities less risky through loan or credit guarantees are likely to be important in improving access to finance for innovative and export-oriented SMEs. The expectation would be that resulting innovation and exporting would help to establish the type of virtuous circle described earlier allowing firms to generate export earnings, overcome capital constraints and increase capital investment (Shaver, 2011).

Table 1. Overview of areas of agreement and contention.

	Internal enablers	External enablers	Innovation, exporting and growth
<i>Areas of agreement</i>	High-quality skills contribute positively to innovation and exporting success.	Purposive links formed between SMEs can play a positive role in innovation and export growth.	There is a strong positive association between innovation, exporting and performance in terms of productivity and/or growth.
	The importance of technical skills is also increasingly matched by the value of networking and team-working skills.	SME links are likely to be more positive in 'stronger' eco-systems and where SMEs have greater absorptive capacity.	Innovation and exporting appear to work jointly to improve performance.
	There is strong positive relationship between R&D and innovation across all firm size bands and industries.	Targeted public support for innovation and exporting yield significant additionality.	There is a substantial element of interdependence between innovation and exporting, and self-selection is common.
	Innovation and export success are positive related to firms' physical capital investments.	Demand-side factors can provide an important stimulus to both innovation and exporting.	
	A positive relationship exists between innovation and export activity and strong cash-flow and liquidity.	The evidence emphasises the positive role of consumer or user-led innovation and public procurement in stimulating SME development.	
<i>Areas of contention</i>	Robust evidence on the role of people management and employee engagement in shaping firms' innovation and exports is limited, particularly in SMEs.	Relatively little is known about the mechanisms through which the gains from 'being there' operate, particularly for SMEs.	Evidence on SMEs is fairly patchy – specifically, we know little about how much the innovation–exporting–performance relationship involves self-selection for SMEs.
	There has been little rigorous analysis of the returns to design in SMEs.	It is unclear which eco-system characteristics are influential for SMEs' innovation and export success.	Information on different types of innovation and their effects on SME performance is limited.
	The innovation and export benefits of IP management in SMEs remain poorly understood.	It is unclear which types of purposive linkages have the greatest benefits for SMEs, particularly in terms of supporting export development.	Evidence on the performance implications of intermittent exporting by SMEs is limited.
	The links between workforce diversity and other firm characteristics such as family ownership, firms' innovation and export success remain little explored.	There is some uncertainty about the importance of learning by exporting for SMEs.	What should the key measure be? Productivity is the key issue in many studies, following the theoretical literature, but should (sales) growth be the key performance measure?
	Relatively little is known about the relationship between business strategy and planning and innovation and exporting success in SMEs.		

Second – and despite their importance – demand conditions in the United Kingdom are said to be only moderately favourable to innovation with both consumer and business demand for innovative products lagging other advanced economies (Allman et al., 2011). For SMEs, this means that the UK market stimulus for innovation is relatively weak compared to that of export markets, reinforcing the importance of exporting as a driver for UK innovation. For the UK government, this suggests the potential value of continuing to strengthen demand for innovative products from SMEs through mechanisms such as public procurement and schemes such as the Small Business Research Initiative (SBRI).⁵

Creating a conducive eco-system is a necessary, but not sufficient, condition to promote innovation and exporting success among SMEs (House of Commons Science and Technology Committee, 2013). The eco-system becomes most valuable when SMEs take full advantage of the resources it offers. In part, this reflects a firm's internal absorptive capacity – itself strongly dependent on skills and R&D investments – but it may also depend on an ability or willingness to develop innovation and export partnerships. In other words, this suggests that there may be a role for public agencies in helping SMEs to overcome informational barriers and identify innovation and export partners. Such interventions may in part be justified on public policy grounds because of recent evidence on externalities of openness – the finding that firms operating in an environment of dense innovation networks tend to benefit in innovation terms, even if the individual firm itself is not particularly open or well networked (Roper et al., 2013). More work is required to determine whether such externalities can benefit SMEs, but if this is the case – and given the evidence reviewed that SMEs can benefit more from some forms of openness than larger firms – this may well be an area worthy of policy scrutiny at both the national and potentially more local (e.g. Local Enterprise Partnership) level.

The evidence discussed in this article also indicates clear synergies between innovation and exporting and the importance of considering them jointly when attempting to maximise their joint performance benefits. It should be stressed that more research is required to be certain that the innovation–exporting–performance nexus operates as clearly for SMEs as it does for larger firms; nevertheless, there are lessons for policy here. Specifically, the evidence suggests the value of coordinated policy support, with either a single agency responsible for both innovation and export support or at least a close alignment between policy on both areas. Equally important, however, is ensuring that the day-to-day support offered to individual SMEs seeking to develop their innovation and exporting performance is as seamless and locally accessible as possible (House of Commons Science and Technology Committee, 2013: 34–36).

Acknowledgements

We are grateful to the editor and to the two anonymous referees for useful comments on an earlier draft of this article. Remaining errors are our own. The views expressed are those of the authors and do not necessarily represent the views of the Enterprise Research Centre funders.

Funding

This research was undertaken as part of the research programme of the Enterprise Research Centre (ERC). The ERC is an independent research centre funded by the Economic and Social Research Council (ESRC), the Department for Business, Innovation & Skills (BIS), the Technology Strategy Board (TSB) and, through the British Bankers Association (BBA), by the Royal Bank of Scotland PLC, HSBC Bank PLC, Barclays Bank PLC and Lloyds TSB Bank PLC.

Notes

1. The biennial Small Business Survey carried out by Department for Business, Innovation & Skills (BIS) has information on both innovation and exporting activities for UK SMEs, but unfortunately provides no cross-tabulation on these activities.

2. An intuitive – and suitably broad – innovation definition is suggested by the US Advisory Committee on Measuring Innovation which defines innovation as follows: ‘The design, invention, development and/or implementation of new or altered products, services, processes, systems, organisational structures or business models for the purpose of creating new value for customers and financial returns for the firm’.
3. Limitations of space mean that we pay relatively little attention here to the potentially contrasting performance impacts of radical and incremental innovations. For an example of an excellent recent analysis on this theme, see Buddelmeyer et al. (2010).
4. These are firms which internationalise early in their lifecycle and tend to be heavily involved in international activities virtually from formation. Although not numerous, born globals may be important: evidence for the United Kingdom suggests that while they account for only around 2% of firms in the marketable goods and services sector, they are much more likely to innovate and perform research and development (R&D) than non-exporters and tend to be more productive than non-exporters. They also tend to be concentrated in high technology sectors (BIS, 2010: 21–22).
5. The UK lags international best practice in this respect with opportunities at both national and regional level. See, for example, publications at: <http://underpin.portals.mbs.ac.uk/>.

References

- Adonis A (2014) *Mending the Fractured Economy – Smarter State, Better Jobs*. London: Policy Network.
- Allman K, Edler J, Georghiou L, et al. (2011) *Measuring wider framework conditions for successful innovation: A systems review of UK and international innovation data*. Innovation Index Report, January. London: NESTA.
- Asheim B, Coenen L, Moodysson J, et al. (2007) Constructing knowledge-based regional advantage: Implications for regional innovation policy. *International Journal of Entrepreneurship and Innovation Management* 7: 140–155.
- Audretsch DB (2002) The dynamic role of small firms: Evidence from the US. *Small Business Economics* 18(1–3): 13–40.
- Aw BY, Roberts MJ and Winston T (2007) Export market participation, investments in R&D and worker training, and the evolution of firm productivity. *The World Economy* 30: 83–104.
- Beamish PW and Lu JW (2006) SME internationalization and performance: Growth vs profitability. *Journal of International Entrepreneurship* 4: 27–48.
- Bellone F, Musso P, Nesta L, et al. (2010) Financial constraints and firm export behaviour. *The World Economy* 33(3): 347–373.
- Berends H, Reymen I, Stultiens RGL, et al. (2011) External designers in product design processes of small manufacturing firms. *Design Studies* 32(1): 86–108.
- Blackburn RA (2003) *Intellectual Property and Innovation Management in Small Firms*. London: Routledge.
- Bonaccorsi A (1992) On the relationship between firm size and export intensity. *Journal of International Business Studies* 23: 605–635.
- Braczyk HJ, Cooke P and Heidenreich M (1998) *Regional Innovation Systems: The Role of Governance in a Globalised World*. London and Philadelphia, PA: UCL Press.
- Brambilla I, Lederman D and Porto G (2012) Exports, export destinations, and skills. *American Economic Review* 102: 3406–3438.
- Bresnahan TF and Gambardella A (2004) *Silicon Valley and Its Imitators*. Cambridge: Cambridge University Press.
- Brunswick S and Vanhaverbeke W (2011) *Beyond open innovation in large enterprises: How do Small and Medium-Sized Enterprises (SMEs) open up to external innovation sources?* Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1925185
- Buddelmeyer H, Jensen PH and Webster E (2010) Innovation and the determinants of company survival. *Oxford Economic Papers* 62(2): 261–285.
- Cainelli G, Evangelista R and Savona M (2006) Innovation and economic performance in services: A firm-level analysis. *Cambridge Journal of Economics* 30: 435–458.
- Cassiman B, Golovko E and Martínez-Ros E (2010) Innovation, exports and productivity. *International Journal of Industrial Organization* 28: 372–376.

- Cereda M, Crespi G, Criscuolo C, et al. (2005) *Design and company performance: Evidence from the community innovation survey*. DTI Report, November. London: Department of Trade and Industry (DTI).
- Chesborough HW (2003) *Open Innovation*. Cambridge, MA: Harvard University Press.
- Clausen T, Pohjola M, Sapprasert K, et al. (2012) Innovation strategies as a source of persistent innovation. *Industrial and Corporate Change* 21(3): 553–585.
- Comacchio A, Bonesso S and Pizzi C (2012) Boundary spanning between industry and university: The role of Technology Transfer Centres. *Journal of Technology Transfer* 37: 943–966.
- Combes PP, Duranton G, Gobillon L, et al. (2009) *The productivity advantages of large cities: Distinguishing agglomeration from firm selection*. SERC Research Paper SERCDP0027, October. London: Spatial Economics Research Centre (SERC).
- Cooney R (2010) Exploring skill ecosystems in the Australian meat processing industry: Unions, employers and institutional change. *Economic and Labour Relations Review* 21: 121–138.
- Crepon B, Duguet E and Mairesse J (1998) Research, innovation and productivity: An econometric analysis at the firm level. *Economics of Innovation and New Technology* 7: 115–158.
- Crick D (2003) The international entrepreneurial decision of UK SMEs to discontinue overseas activities: A research note reporting practices within the clothing industry. *Journal of International Entrepreneurship* 1(4): 405–413.
- Cui AS and O'Connor G (2012) Alliance portfolio resource diversity and firm innovation. *Journal of Marketing* 76: 24–43.
- Department for Business, Innovation & Skills (BIS) (2010) *Internationalisation of innovative and high growth firms*. Economics Paper no. 5, March. London: BIS.
- Department for Business, Innovation & Skills (BIS) (2011) *International trade and investment – The economic rationale for government support*. Economics Paper no. 13, May. London: BIS.
- Design Council (2012) *Designing demand – National evaluation 2007–2012*. Report by Eden Partners, May. London: Design Council. Available at: http://www.designcouncil.org.uk/sites/default/files/asset/document/Designing%20Demand_Executive_Summary_Final.pdf
- Driffield N, Du J, Hart M, et al. (2010) *A comparative evaluation of the impact of UK trade & investments R&D programme and other UKTI support that impacts R&D*. Report for UK Trade and Investment, March. Birmingham: Economics & Strategy Group, Aston Business School, Aston University.
- Eckaus RS (2008) An inquiry into the determinants of the exports of China and India. *China & World Economy* 16(5): 1–15.
- Eliasson K, Hansson M and Lindvert M (2012) Do firms learn by exporting or learn to export? Evidence from small and medium-sized enterprises. *Small Business Economics* 39: 453–472.
- Esteve-Perez S, Manez-Castillejo JA and Sanchis-Llopis JA (2008) Does a survival-by-exporting effect for SMEs exist? *Empirica* 35: 81–104.
- European Commission (2010) *Internationalisation of European SMEs*. Brussels: Directorate-General for Enterprise and Industry, European Commission.
- Flor M and Oltra MJ (2005) The influence of firms technological capabilities on export performance in supplier-dominated industries: The case of ceramic tiles firms. *R&D Management* 35(3): 333–347.
- Foreman-Peck J (2013) Effectiveness and efficiency of SME innovation policy. *Small Business Economics* 41(1): 55–70.
- Freel MS (2005) Patterns of innovation and skills in small firms. *Technovation* 25: 123–134.
- Freel MS and Robson PJA (2004) Small firm innovation, growth and performance – Evidence from Scotland and northern England. *International Small Business Journal* 22: 561–575.
- Freeman J, Styles C and Lawley M (2012) Does firm location make a difference to the export performance of SMEs? *International Marketing Review* 29: 88–113.
- Ganotakis P and Love JH (2011) R&D, product innovation, and exporting: Evidence from UK new technology based firms. *Oxford Economic Papers: New Series* 63: 279–306.
- Ganotakis P and Love JH (2012a) Export propensity, export intensity and firm performance: The role of the entrepreneurial founding team. *Journal of International Business Studies* 43: 693–718.
- Ganotakis P and Love JH (2012b) The innovation value chain in new technology-based firms: Evidence from the UK. *Journal of Product Innovation Management* 29: 839–860.

- Garcia-Morales VJ, Jimenez-Barrionuevo MM and Gutierrez-Gutierrez L (2012) Transformational leadership influence on organizational performance through organizational learning and innovation. *Journal of Business Research* 65(7): 1040–1050.
- Gemser G and Leenders M (2001) How integrating industrial design in the product development process impacts on company performance. *Journal of Product Innovation Management* 18: 28–38.
- Glückler J (2013) Knowledge, networks and space: Connectivity and the problem of non-interactive learning. *Regional Studies* 47: 880–894.
- Goffin K and Micheli P (2010) Maximising the value of industrial design in new product development. *Research-Technology Management* 53(5): 29–37.
- Golovko E and Valentini G (2011) Exploring the complementarity between innovation and export for SMEs growth. *Journal of International Business Studies* 42: 362–380.
- Griffith R, Redding S Van Reenan J (2003) R&D and absorptive capacity: Theory and empirical evidence. *Scandinavian Journal of Economics* 105(1): 99–118.
- Griliches Z (1995) *R&D and Productivity: Econometric Results and Measurement Issues*. Oxford: Blackwell.
- Grossman GM and Helpman E (1991) Trade, knowledge spillovers, and growth. *European Economic Review* 35: 517–526.
- Gumed V (2004) Export propensities and intensities of small and medium manufacturing enterprises in South Africa. *Small Business Economics* 22: 379–389.
- Haahiti A, Madupu V, Yavas U, et al. (2005) Cooperative strategy, knowledge intensity and export performance of small and medium sized enterprises. *Journal of World Business* 40(2): 124–138.
- Hall BH, Lotti F and Mairesse J (2009) Innovation and productivity in SMEs: Empirical evidence for Italy. *Small Business Economics* 33: 13–33.
- Harris R and Li QC (2009) Exporting, R&D, and absorptive capacity in UK establishments. *Oxford Economic Papers* 61: 74–103.
- Harris R and Li QC (2010) *Study of the relationship between innovation, exporting and the use of e-commerce*, June. London: UK Trade & Investment.
- Harris R and Moffatt J (2011) *R&D, innovation and exporting*. SERC Discussion Paper 73, March. London: Spatial Economics Research Centre (SERC).
- Helpman E, Melitz M and Yeaple S (2004) Export versus FDI with heterogeneous firms. *American Economic Review* 94: 300–316.
- Herrmann AM and Peine A (2011) When national innovation system meet varieties of capitalism arguments on labour qualifications: On the skill types and scientific knowledge needed for radical and incremental product innovations. *Research Policy* 40: 687–701.
- Heseltine M (2013) *No Stone Unturned: In Pursuit of Growth*. London: BIS.
- Hewitt-Dundas N and Roper S (2009) Output additionality of public support for innovation: Evidence for Irish manufacturing plants. *European Planning Studies* 18: 107–122.
- He ZL and Wong PK (2012) Reaching out and reaching within: A study of the relationship between innovation collaboration and innovation performance. *Industry and Innovation* 19: 539–561.
- Holgersson M (2013) Patent management in entrepreneurial SMEs: A literature review and an empirical study of innovation appropriation, patent propensity, and motives. *R&D Management* 43(1): 21–36.
- House of Commons Science and Technology Committee (2013) *Bridging the Valley of Death: Improving the Commercialisation of Research*. London: HMSO.
- Iammarino S, Piva M and Vivarelli M (2012) Technological capabilities and patterns of innovative cooperation of firms in the UK regions. *Regional Studies* 46: 1283–1301.
- Ibrahim SE and Ogunyemi O (2012) The effect of linkages and information sharing on supply chain and export performance. *Journal of Manufacturing Technology Management* 23: 441–463.
- Jones MV (2001) First steps in internationalisation: Concepts and evidence from a sample of small high-technology firms. *Journal of International Management* 7(3): 191–210.
- Jones O and Craven M (2001) Beyond the routine: Innovation management and the Teaching Company Scheme. *Technovation* 21: 267–279.
- Keupp MM, Palmié M and Gassmann O (2012) The strategic management of innovation: A systematic review and paths for future research. *International Journal of Management Reviews* 14(4): 367–390.

- Knight GA and Kim D (2009) International business competence and the contemporary firm. *Journal of International Business Studies* 40: 255–273.
- Lanjouw JO and Schankerman M (2003) Protecting intellectual property rights: Are small firms handicapped. *The Journal of Law and Economics* 47(1): 45–74.
- Laursen K and Salter A (2006) Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal* 27: 131–150.
- Leiponen A (2005) Skills and innovation. *International Journal of Industrial Organization* 23: 303–323.
- Leiponen A (2012) The benefits of R&D and breadth in innovation strategies: A comparison of Finnish service and manufacturing firms. *Industrial and Corporate Change* 21: 1255–1281.
- Leiponen A and Byma J (2009) If you cannot block, you better run: Small firms, cooperative innovation, and appropriation strategies. *Research Policy* 38(9): 1478–1488.
- Leydesdorff L and Etkowitz H (1998) The triple helix as a model for innovation studies. *Science and Public Policy* 25(3): 195–203.
- Lichtenthaler U (2010) Intellectual property and open innovation: An empirical analysis. *International Journal of Technology Management* 52(3–4): 372–391.
- Love JH and Ganotakis P (2013) Learning by exporting: Lessons from high-technology SMEs. *International Business Review* 22: 1–17.
- Love JH, Hewitt-Dundas N and Roper S (2010) Service innovation, embeddedness and business performance. *Regional Studies* 44: 983–1004.
- Love JH, Roper S and Bryson J (2011) Knowledge, openness, innovation and growth in UK business services. *Research Policy* 40(10): 1438–1452.
- Love JH, Roper S and Du J (2009) Innovation, ownership and profitability. *International Journal of Industrial Organization* 27(3): 424–434.
- McCloud D and Clarke N (2009) *Engaging for Success: Enhancing Performance through Employee Engagement*. London: BIS.
- MacPherson A (2000) The role of international design orientation and market intelligence in the export performance of US machine tool companies. *R&D Management* 30(2): 167–176.
- Mamuneas T and Nadiri MI (1996) Public R&D policies and cost behaviour of the US manufacturing industries. *Journal of Public Economics* 63: 57–81.
- Millward H and Lewis A (2005) Barriers to successful new product development within small manufacturing companies. *Journal of Small Business and Enterprise Development* 12(3): 379–394.
- Mowery D and Rosenberg N (1979) The influence of market demand upon innovation: A critical review of some recent empirical studies. *Research Policy* 8(2): 102–153.
- Organisation for Economic Co-operation and Development (OECD) (1999) *Managing National Innovation Systems*. Paris: OECD.
- Oke A, Burke G and Myers A (2007) Innovation types and performance in growing UK SMEs. *International Journal of Operations & Production Management* 27: 735–753.
- Pellegrino G, Piva M and Vivarelli M (2009) *How do young companies innovate?* IZA Discussion Paper DP no. 4301, July. Bonn: Institute for the Study of Labor (IZA).
- Piergiovanni R, Santarelli E and Vivarelli M (1997) From which source do small firms derive their innovative inputs? Some evidence from Italian industry. *Review of Industrial Organization* 12(2): 243–258.
- Ricci LA and Trionfetti F (2012) Productivity, networks and export performance: Evidence from a cross-country dataset. *Review of International Economics* 20: 552–562.
- Riding A, Orser BJ, Spence M, et al. (2012) Financing new venture exporters. *Small Business Economics* 38: 147–163.
- Rogers M, Helmers C and Greenhalgh C (2007) *An analysis of the characteristics of small and medium enterprises that use intellectual property*. IPO research report, London, October. Available at: <http://www.ipo.gov.uk/ipresearch-characteristics-200710.pdf>
- Roper S, Du J and Love JH (2008) Modelling the innovation value chain. *Research Policy* 37: 961–977.
- Roper S, Vahter P and Love JH (2013) Externalities of openness in innovation. *Research Policy* 42: 1544–1554.
- Rosing K, Frese M and Bausch M (2011) Explaining the heterogeneity of the leadership-innovation relationship: Ambidextrous leadership. *Leadership Quarterly* 22: 956–974.

- Seo HJ, Lee YS and Kim H (2012) The determinants of export market performance in Organisation for Economic Co-operation and Development service industries. *Service Industries Journal* 32(8): 1343–1354.
- Shaver JM (2011) The benefits of geographic sales diversification: How exporting facilitates capital investment. *Strategic Management Journal* 32: 1046–1060.
- Shefer D and Frenkel A (1998) Local milieu and innovations: Some empirical results. *Annals of Regional Science* 32: 185–200.
- Stöttinger B and Holzmüller HH (2001) Cross-national stability of an export performance model – A comparative study of Austria and the US. *Management International Review* 41: 7–28.
- Toedting F, Lengauer L and Hoeglinger C (2011) Knowledge sourcing and innovation in thick and thin regional innovation systems – Comparing ICT firms in two Austrian regions. *European Planning Studies* 19(7): 1245–1276.
- Tomiura E (2007) Effects of R&D and networking on the export decision of Japanese firms. *Research Policy* 36: 758–767.
- Trajtenberg M (2000) *R&D policy in Israel: An overview and reassessment*. NBER Working Paper no. 7930, October. Cambridge, MA: National Bureau of Economic Research (NBER).
- Ughetto E (2008) Does internal finance matter for R&D? New evidence from a panel of Italian firms. *Cambridge Journal of Economics* 32(6): 907–925.
- Vaccaro IG, Jansen JJP, Van Den Bosch FAJ, et al. (2012) Management innovation and leadership: The moderating role of organizational size. *Journal of Management Studies* 49(1): 28–51.
- Vahter P, Love JH and Roper S (2013) Openness and innovation performance: are small firms different? Research Paper 12 Enterprise Research Centre.
- Van de Vrande V, de Jong JPI, Vanhaverbeke W, et al. (2009) Open innovation in SMEs: Trends, motives and management challenges. *Technovation* 29: 423–437.
- Verganti R (2009) *Design-Driven Innovation*. Boston, MA: Harvard Business Press.
- Veugelers R and Cassiman B (1999) Make and buy in innovation strategies: Evidence from Belgian manufacturing firms. *Research Policy* 28: 63–80.
- Vossen RW (1998) Relative strengths and weaknesses of small firms in innovation. *International Small Business Journal* 16: 88–95.
- Wagner J (2007) Exports and productivity: A survey of the evidence from firm-level data. *The World Economy* 30: 60–82.
- Welch CL and Welch LS (2009) Re-internationalisation: Exploration and conceptualisation. *International Business Review* 18: 567–577.
- Wheeler C, Ibeh K and Dimitratos P (2008) UK export performance research – Review and implications. *International Small Business Journal* 26(2): 207–239.
- Witty A (2013) *Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth* (Final Report and Recommendations). London: BIS.
- Young D (2014) *Enterprise for All – The Relevance of Enterprise in Education*. London: BIS.

Author biographies

Jim H Love is Professor of International Business and Innovation at Warwick Business School and leads the Enterprise Research Centre's research theme on innovation and exporting. Jim moved to Warwick in 2014 having previously held professorial positions at Aston Business School, Birmingham and Birmingham University.

Stephen Roper is Professor of Enterprise at Warwick Business School and Director of the Enterprise Research Centre. Stephen joined Warwick in 2008 having previously been Professor of Business Innovation at Aston Business School, Birmingham and Assistant Director of the Northern Ireland Economic Research Centre, Belfast.