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Beating Competitors to International Markets: The Value of Geographically Balanced Networks for Innovation

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Abstract:

Being able to launch new products internationally is critical for technology-based ventures to recoup the high costs of R&D and to exploit their innovations fully. Despite the widely recognized importance of networks within the innovation development process, there appear to be contrasting viewpoints as to whether local or foreign network partners contribute more in the race to internationalize. Drawing on the theoretical underpinnings of comparative advantage, we propose and empirically confirm that ventures pursuing a balance of local and foreign network connections for the development of an innovation are able to bring the product more rapidly into the international marketplace. Furthermore, both innovation complexity and industry clockspeed heighten the importance of geographic network balance to the speed of product internationalization.

Keywords: internationalization, ventures, innovation, network balance, clockspeed

INTRODUCTION

Globalization and recent advances in communication technologies provide new ventures with easier access to a multitude of geographic markets (Knight and Cavusgil, 1996) and, therefore, more opportunities abroad for commercializing their new product innovations. Due to increased technological turbulence and shortening product life cycles, however, the value of new innovations rapidly deteriorates (Klepper, 1996). Thus, there is a sense of heightened urgency to enter the international marketplace to exploit fully the demand for new product innovations and bring in revenues to help offset the high costs of innovation development (Oviatt and McDougall, 1995). Indeed, prior research confirms faster entry into foreign markets is linked to higher venture performance (Schwens, Eiche, and Kabst, 2011).

To manage the increased urgency to internationalize innovations alongside the potentially debilitating effects of liabilities of newness, smallness, and foreignness, ventures increasingly rely on network collaboration (Oviatt and McDougall, 1994). Such networks play a valuable role in opening conduits to much-needed knowledge, thereby increasing new product development speed and lowering internationalization risks (de Man and Duysters, 2005). Despite the widely recognized importance of networks, it is less clear in the literature whether ventures must focus on local or foreign network collaboration during the innovation process to ensure more rapid transition into the global marketplace. An inherent tension arises in whether attaining internationalization knowledge through foreign partners (with increasing coordination costs) or proximate based efficiencies through local partners (with limited internationalization knowledge) should be prioritized.

Building on and extending Hoang and Rothaermel (2010), who explored the role of developing exploitation- and exploration-related innovations within and across firm boundaries, we argue that the combination of foreign and local network collaboration for innovation can provide a venture with differing, yet complementary, capabilities necessary for rapid internationalization. Achieving balance in geographic networks to promote exploration- and exploitation-based learning was recently studied by Coombs, Deeds, and Ireland (2009). We believe there is much relevancy to the topic of how ventures expedite internationalization of their new product innovations. In addition to exploring the role of geographically balanced networks on new product internationalization speed, we examine whether certain factors heighten, or lessen, the criticality of such geographic network balance or dual focus on network efficiency in local and foreign networks. In particular, innovation complexity and industry clockspeed exemplify the conditions under which a balanced geographic network could be influential. While innovation complexity is defined by the number of components, component interfaces and subsystems in a product architecture (Clark and Wheelwright, 1993), industry clockspeed refers to the rate of change based on the aggregate actions initiated by *all* incumbent firms (Fine, 1998).

Our study draws from the literatures of international entrepreneurship, networks, and new product development, and we make multiple contributions to each. In brief, our findings provide greater clarity to the role of a venture's networks in the speed of internationalization of their new product innovations by demonstrating that scholars should consider the configuration of both global and local networks jointly. Contingencies related to innovation complexity and industry clockspeed offer further understanding of geographic network balance in enhancing a venture's ability to reach international markets quickly with its new product innovation.

THEORY AND HYPOTHESES

The pressure to launch a new product concurrently or ahead of competitors in local and foreign markets is motivated by the emergence of global buyer segments, fear of technological obsolescence, and need for industry leadership in product innovation (Li, Nicholls, and Roslow, 2003). Despite the wealth of literature that has surfaced linking new product development to internationalization (Cassiman and Golovko, 2011; Lim, Sharkey, and Heinrichs, 2003), an interesting observation is that the majority of these studies have focused on the internationalization behaviors of the firm as a whole, rather than the internationalization of the individual new product innovation. Furthermore, the understanding of factors that influence the *speed* of international entry for an individual new product innovation remains elusive. To aid in our understanding of the factors that contribute to the internationalization speed of a new product, we interpolate from the international entrepreneurship literature where internationalization speed has been frequently recognized and examined in the context of new ventures (e.g. Oviatt and McDougall, 2005; Yu, Gilbert, and Oviatt, 2011).

New ventures are known to suffer from the liabilities of newness and smallness, and when internationalizing, these liabilities are magnified further by the added liability of foreignness (Zaheer, 1995). Ventures with international aspirations are able to overcome these challenges through an increased reliance on networks (Oviatt and McDougall, 1994). Indeed, the criticality of networks in the internationalization process is so pronounced that when firms lack such networks they are assumed to be at a disadvantage (Johanson and Vahlne, 2009). In addition to resources and credibility, such networks provide access to market-specific business knowledge needed to internationalize (Eriksson *et al*., 2000). While networks can therefore help ventures overcome the firm-specific costs associated with internationalization, we similarly posit that a venture's reliance on networks during the innovation development process is essential to aid in the race to sell its newly innovated product in the international marketplace. However, due to limited resources and increased urgency to internationalize innovations, an important question is which networks are strategically most important to focus on during the innovation process to ensure a more rapid commercialization into the global marketplace. A closer look at the literature reveals two contrasting viewpoints as to whether the local or foreign network collaboration should be prioritized.

Foreign network collaboration

Through foreign network partners, ventures take advantage of key sources of technological knowledge from around the world to launch their products more quickly internationally (Subramaniam and Venkatraman, 2001). With the rise of faster and cheaper communication technologies and integration of global markets, technological knowledge is becoming more globally dispersed. As summarized by Eriksson and colleagues (2000), the knowledge required to internationalize has been classified into institutional (i.e., rules and regulations within a foreign country), business (i.e., needs and characteristics of foreign customers), and internationalization (i.e., process-oriented) knowledge. As the institutional and business knowledge must be current and country-specific, existing innovation partnerships in a foreign country of interest represent an efficient means for gaining such knowledge.

Foreign network collaborations boost the inflow of new knowledge to the product development process (Subramaniam, 2006), resulting in a commercially viable, culturally adaptable, and institutionally legitimized product for the global marketplace. This is exemplified in a study by Mort and Weerawardena (2006), whereby an Australian venture introduced environmentally friendly air conditioning systems based on knowledge gleaned from collaboration in Europe. Foreign network collaboration for innovation development can help build a pathway for accessing knowledge necessary to enter foreign markets.

While foreign collaboration offers many benefits, there are also significant costs and risks involved with foreign partners, as they require greater investments in developing communication and coordination routines to support ongoing interactions necessary for product commercialization. Unlike Multinational Enterprises, new ventures typically lack the resources for building governance structures to cope with such increased cost of global collaboration/alliances, such as establishing R&D labs overseas. There is also the possibility of increased adverse selection and moral hazard with foreign partners (Yan and Gray, 1994), as well as constraints related to knowledge exchanges in distant cultural and institutional domains (Parkhe, 1991).

Local network collaboration

Although the literature has tended to emphasize creating and exploiting foreign network partners within the innovation development process to support a firm's efforts to internationalize, there is an alternative, less-explored perspective that highlights the role of local network partners. Local network collaboration can foremost help build the so-called ‘competitive currencies’ for technology-based ventures to access more rapidly foreign markets. In their study of small Argentine firms in the furniture industry, Mesquita and Lazzarini (2008) demonstrated that local collaboration creates collective efficiencies that overcome internal infrastructure limitations to create cost-based competitive advantages and faster product innovation to facilitate internationalization. While Mesquita and Lazzarini made their arguments in the context of developing countries, we suggest that even within developed countries, networks of small firms can likewise have an influence on helping ventures more easily reach foreign markets. Case studies examined by Chetty and Campbell-Hunt (2003) also show small- and medium-sized firms in New Zealand had strong local networks first and used their local networks as a base to launch into international markets.

It is recognized that technology-based ventures may have an inherent bias for local collaboration (Rosenkopf and Almeida, 2003; Stuart and Podolny, 1996). This is due largely to the ingrained bias for local knowledge search and the greater ease of searching locally. Proximity of collaboration is especially critical for smaller firms, which, unlike their larger counterparts, are less able to attain knowledge solely through internal research and development efforts (Tödtling and Kaufman, 2001). As innovation is an interactive process and the exchange of tacit information is favored by face-to-face contact (Kaufmann and Tödtling, 2001), local network collaboration can be vital for technology-based ventures. Firms in knowledge-intensive industries have a higher propensity to colocate and collaborate together in geographic clusters (Audretsch and Feldman, 1996). Significant innovative activity frequently emerges out of geographical cluster areas, largely due to the knowledge spillovers and collaborations that take place.

Local network collaboration for innovation development can also serve as the catalyst to increase the speed of new product commercialization into the foreign marketplace. Firms internationalize by either proactively *pushing* their product abroad or being *pulled* into foreign markets by either customers or larger companies with whom they collaborate. In either case, the local network serves an important role. Rugman and D'Cruz (1993) illustrated the concept whereby a network of businesses that are being led by a flagship firm and supported by key customers, suppliers, competitors, and nonbusiness infrastructure is ‘pulled’ into the international marketplace by the flagship firm. The flagship firm is typically a multinational firm in the collaborative network that enables other firms in the network to pursue a global strategy. The partners in the network that support the flagship firm are able to benefit by increased sales volume as well as sharing of key information and knowledge. This suggests that technology-based ventures can vicariously tap into international knowledge through collaboration with larger, multinational firms. Likewise, the flagship firm can bring the collaborating venture abroad to service its other subsidiaries.

While the shortened new product development process resulting from local network collaboration is thus argued to contribute to the race into foreign markets, there are additional costs that could minimize this impact. Most evident is the limited institutional and business knowledge required for internationalization that needs to be current and country-specific (Eriksson *et al*., 2000). Such knowledge limitations can not only slow the internationalization process but could also result in an innovation that is not as customized or highly demanded in foreign markets. Furthermore, the lack of establishing relationships in a foreign country could stall the ability of a venture to identify quickly potential customers or selling outlets for the innovation.

Geographic network balance

As technology-based ventures have limited time and resources coupled with an urgency to internationalize, the question thus becomes whether local or foreign network collaboration for innovation development should be prioritized. The inherent tension that exists between the pursuit of foreign and local network partners results from the conflicting performance requirements associated with the quest to enter international markets rapidly. Foreign network partners enable global knowledge sourcing, the discovery of local application for their innovation, and the acquisition of key institutional and business knowledge to enter foreign markets. The tradeoff, or downside, is the additional costs in terms of time and resources, to coordinate such efforts. On the other hand, local network partners help create local advantages to leverage overseas and, perhaps most importantly, help speed up the new product development process through proximate-based efficiencies. While critical, such local partners do not provide that critical internationalization knowledge or local acclimation abilities. Thus, the tension lies in whether attaining the internationalization knowledge through foreign partners or proximate-based efficiencies through local partners should be prioritized.

We suggest that the venture is best served by efforts to build both a local and a foreign network, as opposed to a singular focus on either. Building on the earlier conceptualization of network efficiency (e.g. Baum, Calabrese, and Silverman, 2000), or balance in focus on different network participants, Coombs *et al*. (2009) find that a geographically balanced network aids in the development of new products largely due to the diversity and efficiency of the firm's knowledge search processes. In a similar vein, technology-based ventures could leverage the new product development that results from geographic network balance to enter foreign markets more rapidly.

Network configurations that simultaneously incorporate diverse and essential knowledge while keeping the costs of coordination and difficulty of knowledge transfer at a minimum will have faster internationalization speed. In particular, a collaborative network can be considered efficient when providing access to knowledge that is both essential for making an exportable innovation market-ready and providing a diversity of sufficiently accessible knowledge inputs. A sole focus on either local or foreign sources for innovation may lead to incomplete knowledge loci and incomplete cultural and institutional understandings. As explained by Duysters and de Man (2003), alliances function as a radar that enables a venture to gain a glimpse of a variety of up-and-coming technologies and then select knowledge combinations that represent the best fit. Indeed, the importance of network diversity has been highlighted in the network literature as beneficial in gaining access to multiple, differing sources to provide knowledge on a broader number of relevant technological developments (Ahuja, 2000). Diversity in knowledge sources provides sufficiently distinct, yet related, pieces of knowledge (Lavie and Miller, 2008).

Due to the frequent interaction afforded by physical proximity, local networks pursued by a new venture are likely to have developed into stronger ties. In contrast, foreign network connections will typically start as weaker ties and take a longer time to develop due to the additional resources required to maintain and leverage the relationship (Dellestrand and Kappen, 2012). Interestingly, Tiwana (2008) found that strong ties complement bridging ties within innovation-seeking project alliances. While bridging ties connect individuals with diverse backgrounds and thus create ideas and innovation potential, strong ties allow for the integration of the knowledge. Similarly, technology-based ventures that are able to balance both foreign and local ties will likely be better able to integrate knowledge and increase internationalization speed. Such collaboration between foreign and local partners can therefore be complementary (Chetty and Campbell-Hunt, 2003).

The importance of geographic network balance is also indirectly supported in the literature on comparative advantage. Rugman and D'Cruz (1993) argued that many firms draw on strengths from more than one nation. In the case of a technology-based venture, the ability to take advantage of the knowledge diversity, cultural facets, and institutional regimes of multiple countries through foreign network participants may likewise be critical. These strengths can relate to pockets of innovation and technological knowledge or market opportunities. Foreign network collaborations focus on the host country advantages, while local network collaborations leverage home country advantages. The importance of leveraging multiple national strengths to achieve a greater speed to market has also been recognized by Murtha, Lenway, and Hart (2001) in their examination of the evolution of the flat panel display industry. Firms are increasingly moving toward a knowledgedriven competitive orientation, where the focus is to increase innovation speed rapidly by integrating multiple sources of knowledge. Accordingly, we propose

> *Hypothesis 1: A geographic network balanced between foreign and local network collaboration for innovation development increases the speed of new product internationalization*.

We also recognize that some conditions may cause the value of a balanced geographic network to be more, or less, critical for internationalizing new product innovations. We next explore the implications of two potential knowledge-based conditions that are likely to affect the utilization of both local and foreign collaboration networks.

Geographic network balance and innovation complexity

Clark and Wheelwright (1993) define innovation complexity by means of counting the number of components, component-interfaces, and subsystems in a product architecture, thus emphasizing the complexity of the object. New product innovations vary in their level of complexity, or the variety and relatedness among product architectural design elements (Henderson and Clark, 1990). The most influential conceptualization of complex products builds on the classic works by Weaver (1947), Simon (1962), and Perrow (1986). Singh (1997), and Hobday (1998) note that a critical dimension of complexity is the span or variety of distinct knowledge bases, skills, and engineering inputs that are required for the 'proof of concept,' design, and manufacturing of a complex innovation. According to Hobday (1998), more complex products involve the combination of different technologies, which often mandates extensive national and international collaboration.

In addition to variety (or, artefactual complexity), the relatedness component of complexity increases challenges in the development process (Yu, Figueiredo, and De Souza Nascimento, 2010). Kim and Wilemon (2003) adopt Iansiti's (1993) term 'developmental complexity' to denote that complications can be encountered in innovation processes. Although 'simple' products do not have greater variety of subcomponents, development complexity can still be greatly exacerbated with the need to integrate many different research decisions (Kim and Wilemon, 2003) and intensive feedback loops between early and later stages of production (Hobday, 1998). As exemplified by Pisano (1994), developmental complexity is characterized 'by deep theoretical and practical knowledge of the process technology' (p. 85).

Networks help cope with innovation complexity (Kash and Rycroft, 2002; Singh, 1997). Yet, to increase internationalization speed, ventures must seek more diverse knowledge (Madhavan and Grover, 1998) beyond 'local' technological landscapes (Stuart and Podolny, 1996) to manage innovation complexity. Under increasing complexity, compiling and integrating knowledge from foreign and local networks is central to maintaining viability of innovation in the local environment while also ensuring its adaptability to foreign markets. Excessive focus on local needs limits niche overlap with overseas markets and excessive focus on foreign needs stretches locally viable resources to uncertain strategic, institutional, and cultural realms. Therefore, under increasing innovation complexity, internationalization efforts require network balance to combine diverse knowledge rapidly from local and foreign contexts to maximize local and foreign niche overlap.

By balancing local networks with foreign networks in development efforts, ventures mitigate knowledge 'crowding' in local markets while extending knowledge resources to foreign markets.

Through network balance, ventures manage local and foreign user requirements. Diverse cultural, institutional, and technological knowledge from international partners helps develop more extensive loci of product attributes (De Meyer, 1993) and product variety (Hitt, Hoskisson, and Kim, 1997) from the underlying innovations. Distant knowledge flows from foreign collaborators could help identify opportunities in international markets to develop broader loci of component and component recombination possibilities (Ahuja, 2000). In certain sectors and markets, regulatory agencies may even engage in the approval of product design innovations, validating methods of production as well as accreditation (Hobday, 1998). Increasing balance in geographic networks helps ventures to develop complex products that are locally viable and internationally palatable.

Developing complex innovations also requires sufficient levels of mutual information, reciprocity, and trust to allow for more rapid communication and learning. The literature on embeddedness (Granovetter, 1985) suggests that this is best achieved locally. The more geographically proximate, domestic context is likely to promote social embeddedness because shorter physical distance and cultural proximity favor social relationships. Illustrative is Lam's (1997) study of a knowledge-intensive British–Japanese collaboration in a high-tech venture context, which explains how the locally embedded nature of knowledge can impede cross-border collaborative work and knowledge transfer. Following Uzzi (1997), then, combining necessity-based foreign collaboration with local, more embedded collaboration may lead to better internationalization performance in the context of commercializing complex innovations.

Based on the above discussion, with increasing innovation complexity, sourcing component knowledge, and sharing developmental efforts with both local and foreign collaborators increases diversity (Kotabe and Murray, 1990) and speed (Oviatt and McDougall, 2005) of knowledge recombinations that maximize local and foreign niche overlap. Thus, we hypothesize

> *Hypothesis 2: Innovation complexity moderates the relationship between geographic network balance and new product internationalization speed, such that geographic network balance is more positively related to new product internationalization speed when innovation complexity is high relative to when innovation complexity is low*.

Geographic network balance and industry clockspeed

Originally introduced by Fine (1998), industry clockspeed refers to the rate of industry change based on the aggregate actions initiated by *all* incumbent firms. Hence, industry clockspeed takes into account actions at the product, process, and organizational levels. While industry clockspeed considers the *rate* of industry change, it is distinctly different from industry turbulence, where the focus is solely on firms entering and leaving an industry (Audretsch and Acs, 1990). Likewise, industry clockspeed differs from the concept of hypercompetition, which considers the lack of sustainability in competitive advantage due to faster clockspeeds and new entry under industry turbulence.

Industry clockspeed is particularly relevant for young ventures. One of the challenges relating to the liability of newness stems from ventures' lack of operating experience. Yet the potential for feedback learning is minimized in a fast-clockspeed industry as strategic actions that have proven to be effective in the past quickly become outdated (Carrillo, 2005; Mendelson, 2000). Industries with faster clockspeed thus represent a more level playing field for ventures; more established firms have not been able to establish firmly significant competitive advantages as the industry dynamics change rapidly, and their competitive advantages must be more frequently renewed. Because the rate of change is high, there is a greater need for increasing knowledge inflows and launching innovations in foreign markets. Accordingly, with faster clockspeeds there is mounting pressure not to only enter foreign markets early in order to be able to recoup R&D investments and gain first-mover advantages, but also to integrate available knowledge rapidly to speed up the development process.

As noted by Sheremata (2000, 2002), effective balance between an outward reach for knowledge and the inward development and coordination of such knowledge is useful when pursuing a time-sensitive goal. The rate of change within an industry, above referred to as the industry clockspeed, is highly pertinent in the context of our study, as a higher rate of change leads to an increased need to enter foreign markets rapidly to recoup more quickly the cost of a venture's R&D and to exploit its innovation fully. This suggests that the higher the industry clockspeed, the more important it is to be effective with both the outward gathering of knowledge and the inward coordination and development of that knowledge. In other words, a higher industry clockspeed results in a higher relevancy for a balanced geographic network. In sum, fast-clockspeed industries not only represent an opportune context for ventures to innovate, but also emphasize the criticality of managing the new product development process efficiently through pursuing both domestic and international partnerships. Thus, we posit

> *Hypothesis 3: Industry clockspeed moderates the relationship between geographic network balance and new product internationalization speed, such that geographic network balance is more positively related to new product internationalization speed when industry clockspeed is high relative to when industry clockspeed is low*.

METHODS

Our dataset is drawn from multiple sources, including data from the SFINNO database of Finnish innovations, the Bureau Van Dijk database (BvDep), and data constructed through content analysis of headlines of press releases in Factiva and Lexis-Nexis. Our sample consists of 407 product innovations developed by young entrepreneurial ventures. The unit of analysis is the product innovation. While prior studies on innovation and internationalization have typically focused at the firm level, focusing on a single innovation and the networks specifically related to the product development process for the innovation helps more reliably test the proposed hypotheses on speed of product internationalization; additionally, it limits the effects of several resources and capabilities that could confound with underlying innovation efforts.

The SFINNO database of Finnish innovations is compiled by the Group for Innovation Studies at the Technical Research Centre of Finland (VTT), using a combination of two methodologies for the identification of innovations: expert opinion and systematic reviews of trade and technical journals and annual reports. These procedures for collecting innovation data have also been followed in prior object-based data collection efforts that are similar in nature to SFINNO (Acs, Audretsch, and Feldman, 1994). A total of 15 different technical and trade publications have been systematically reviewed since 1985 to identify innovations from a broad range of Finnish companies and industries over time. The focus has been on articles dealing with the introduction of new products, services, and processes that conformed to our definitions and criteria for an innovation. For the purposes of our study and consistent with the guidelines set out in the Organisation of Economic Co-operation and Development's (OECD) Oslo Manual (2005), an innovation is defined as an invention that has been commercialized in the market by a business firm or the equivalent.

For the inclusion of an innovation in the SFINNO database, it had to meet two criteria: (1) the innovation had to have passed successfully through development and prototype phases to the point of market introduction and (2) the innovation had to have been a technologically new or significantly enhanced product as compared with the firm's previous products. Researchers first listed all counted innovations and then carefully compared lists to avoid double-counting before lists were entered in the SFINNO database. As a part of the database compilation, the commercializing firm was also identified from the articles, and then basic firm data such as firm size, age, and industry were collected from the joint business information system of the National Board of Patents and Registration and the Finnish Tax Administration, as well as the Business Register maintained by the national statistical office, Statistics Finland. A distinct feature of the SFINNO database is the addition of innovation-specific self-reported data regarding the development of the innovation and export through a questionnaire survey instrument targeted to the innovators. By ‘innovator’ we mean individuals who were described in the journal articles as key individuals who were involved in the innovation project. In cases where this information was not reported in the source, the R&D manager (for larger organizations) or the founder-CEO (for small organizations) was contacted instead. For additional details, see Palmberg (2004) and Palmberg *et al*. (1999).

To test the proposed framework within the context of international entrepreneurship, we focus on product innovations of young entrepreneurial Finnish firms established between 1995 and 2005. To limit the effects of product development that may have occurred before a venture was formally founded, we included innovations only from those ventures for which serious efforts for product development started after or during the year of founding. We initially identified 528 product innovations from unique firms in the SFINNO database meeting these criteria. Each of the product innovations in our sample was from a unique firm.

The next step in compiling our dataset was the collection of information from archival data sources. The name and address of the firms responsible for developing the product innovations were matched to firms in the Bureau Van Dijk database (BvDep), a comprehensive worldwide database of public and private firms. We were unable to match 121 firms, and therefore the product innovations of these firms were dropped from our sample.1 Next, a content analysis of headlines of press releases in Factiva and Lexis-Nexis was conducted to create additional industry-level variables. The final sample consists of 407 product innovations by young entrepreneurial firms that were established between 1995 and 2005,2 with a mean age of 5.71 years. Although speed of internationalization, or proxied as average time to export, is a censored variable, mean time to export is 4.06 years (s.d. = 5.38 years). The details of scale means and standard deviation are listed in Table 1.

Dependent variable

Our sampling frame focuses on product innovations introduced by ventures that may or may not have internationalized their product through export over the period of observation. The outcome variable is the hazard of exporting an innovation during the period of observation (1995–2005). To calculate the hazard of export we measure the number of years between ‘Innovation prototype development year’ and ‘Export year.’ This variable is titled speed of internationalization. The data on product innovation export were obtained from the SFINNO questionnaire. Of the 407 product innovations, 153 were exported.

Independent variables

Geographic network balance

The operationalization of geographic network balance is based on the balance in two variables: local network efficiency and foreign network efficiency. The intuition related to geographic network balance is that firms must have a balanced focus toward geographically diverse partners located in Finland and abroad. In the SFINNO questionnaire, respondents were asked to report whether one or more of the five types of local and foreign partners were involved in the development of innovation: (1) customers; (2) suppliers; (3) subcontractors; (4) universities; and (5) competitors. For each local and foreign partner involved, the respondents were asked for the importance of collaboration in developing product innovation (0 = Not important; 1 = Of minor importance; 2 = Important; 3 = Of great importance). The measure therefore consists of 10 possible responses on 5 sets of stakeholders in Finland and 5 sets of stakeholders outside Finland.

Given the diversity of stakeholders involved and the recognition that each type of stakeholder could contribute differently to the product development process, we found it necessary to first assess the efficiency among network partner types within the local or foreign context. In doing so, we extend Baum and colleagues' (2000) conceptualization of network efficiency based on structural equivalence among partners, with measures of local and foreign network efficiency that include the relative importance of partners in assisting with the product development. The proposed measure includes first-order network efficiency by including network efficiency of partners in local or foreign geographic region (Equation (1)), and second-order network efficiency by taking one minus an absolute difference in relative focus between local and foreign partners (Equation 2(2)).

We start by measuring the local and foreign network efficiency based on proportion (Herfindahl-Hirschman Index) of relevance of a partner.

$$Local\ Network\ Efficency = \frac{1 - \sum_{i,local_m} \left(PA_{i\ local_m}\right)^2}{highest\ possible\ rating};$$

$$Foreign\ Network\ Efficency = \frac{1 - \sum_{i,foreign_m} \left(PA_{i\ foreign_m}\right)^2}{highest\ possible\ rating} \quad (1)$$

where *m* is the type of alliance partners, *PA* is a proportion of alliance partner rating relative to highest possible rating for one or more of reported categories: (1) customers; (2) suppliers; (3) subcontractors; (4) universities; and (5) competitors. Highest possible rating is the total number of stakeholders involved multiplied by the highest possible rating of 3. Geographic network balance is

$$Geographic\ Network\ Balance = 1 - |Local\ Network\ Efficency - Foreign\ Network\ Efficency| \quad (2)$$

Consider the example whereby the ratings for local network consisted of (1) customers (rating = 1); (2) suppliers (rating = 3); and (3) competitors (rating = 2), and rating of 0 for both (4) universities (rating = 0) and (5) competitors (rating = 0). The highest possible rating for the local network is three partners multiplied by 3 (=9). The local network efficiency is therefore $\left[1 - \left[(1/9)^2 + (3/9)^2 + (2/9)^2\right]\right]/9 = 0.092$. Similarly the foreign network consists of (1) customers (rating 2); (2) suppliers (rating = 1); (3) subcontractors (rating = 2); (4) universities (rating = 0); and (5) competitors (rating = 3). The highest possible rating for four partners is 12. The foreign network efficiency is therefore $\left[1 - \left[(2/12)^2 + (1/12)^2 + (2/12)^2 + (3/12)^2\right]\right]$ / 12 = 0.073. The resulting geographic network balance would be 0.981. Higher values indicate greater balance in network efficiency.

Moderator variables

Innovation complexity

Employing a full list of diverse complexity indicators, including a full count of components, subcomponents, interfaces, and subsystems is unfortunately not feasible in large-scale data collection efforts such as in SFINNO. Assessment of innovation complexity based on trade journals by industry experts in SFINNO was designed to strike a balance between abstraction of complexity across industries and conceptual precision by distinguishing the two important dimensions of complexity: structural (or, artefactual) complexity and development complexity.

Artefactual complex innovations comprise a system consisting of various integrated functional parts, while simple innovations are defined as single units. The developmental complexity is distinguished on the basis of whether the development of an innovation utilizes the knowledge domain of one discipline (simple) or several disciplines (complex). As such, the complexity of an innovation was classified into high complexity ($n = 40$); medium artefactual complexity/high developmental complexity ($n = 192$); medium artefactual complexity/low developmental complexity ($n = 139$); and low complexity ($n = 36$).3 We reverse-coded the items so that higher values indicate increased complexity.

Industry clockspeed

Our measure of industry clockspeed is replicated to the Finnish context from Nadkarni and Narayanan (2007). Industry clockspeed is a reflective measure of (1) product clockspeed, (2) process clockspeed, and (3) organizational clockspeed. The data for these measures were sourced from the Bureau Van Dijk and Factiva/Lexis-Nexis databases reporting information on Finnish firms.

Product clockspeed

Headlines of press releases in Factiva and Lexis-Nexis at one-month intervals were content analyzed for each firm in the four-digit NACE codes. The 407 ventures in the databases represented 39 four-digit NACE codes. The key words used for headline search were: new technology features, expanded use, new versions/generations of products, or new line of products. A total of 5,783 announcements were identified. We randomly picked 10 percent of the coded announcements (578 announcements) and distributed them between two independent coders. The interrater reliability was 0.87 and Cohen's kappa was 0.89. Product clockspeed is measured as the average time between the introduction of new products by all incumbents in the industry.

Process clockspeed

As depreciation expenses are related to the rate of capital replacement, faster depreciation rates indicate rapid process innovation. Calculated from Bureau van Dijk data, process clockspeed is measured as average number of years for which firms (all firms in a four-digit NACE code) depreciated their capital equipment (Fine, 1998; Nadkarni and Narayanan, 2007).

Organizational clockspeed

Groups of firms in each NACE code were first identified, based on the 29 unique four-digit NACE codes in the sample. Next, the pool of announcements for all incumbent firms in the industry from Factiva and Lexis-Nexis databases from 1990 to 2005 were compiled. Duplicate announcements were eliminated as well as announcements made one month before and after the month of announcement. As our focus is on strategic actions as indicators of clockspeed, it is unlikely that the frequency of multiple strategic actions is less than one month.

A total of 49,184 announcements were identified. In the next step, we used content analysis to identify strategic actions from the news headlines on one of the 31 strategic actions listed in Nadkarni and Narayanan4 (2007: 269–270). Based on Nadkarni and Narayanan (2007), we measure organizational clockspeed as the average time span between strategic actions introduced by all incumbent firms in the industry. We draw three random samples representing one percent of the sample (i.e., three random samples of 492 announcements). The three random samples were distributed to three teams of coders consisting of two coders per team. The interrater reliability was 0.85, and Cohen's kappa was 0.87. Organizational clockspeed is the average time span between corporate strategic actions introduced by all firms in each industry. To measure unidimensionality of the measure we conduct EFA. All three indicators load on a single factor (eigenvalue = 4.528), and the factor loadings for product clockspeed (= 0.89), process clockspeed (=0.95), and organizational clockspeed (= 0.87) were significant. The reliability of the measure was 0.84.

Controls

Time varying covariates at the industry level

Based on the recent review by Cannon and St. John (2007) on measurement of *environmental complexity*, we use a four-item reflective measure: (1) one minus the Herfindahl-Hirschman index (H-index) of distribution of market shares; (2) one minus the four-firm concentration index (Firm-4); (3) one minus the eight-firm concentration index (Firm-8); and (4) establishment diversity. Establishment diversity5 is the number and distribution of small, medium, and large organizations based on sales information at the four-digit NACE level from Finnish firms in the Bureau Van Dijk database. The reliability of the four-item measure was 0.89. Next we control for *mean industry-level international sales* (percentage of international sales weighted by firm size from total sales of all firms in each of the four-digit NACE codes) and *market size* (natural log of industry sales at four-digit NACE code level), both of which could increase speed of internationalization.

IP Protection is an indirect indicator of appropriability regime (Dushnitsky and Shaver, 2009) and could have an impact on internationalization.6 Based on OECD Patent reports7 patenting intensity across four-digit NACE codes in Finland is the ratio of total patents (applied for and approved) to total employment in the industry. The ratio was strongly correlated with measures of IP protection in the Carnegie Mellon Survey ($r = 0.883$, $p < 0.001$) and Yale Innovation Survey ($r = 0.874$, $p < 0.001$) (Dushnitsky and Shaver, 2009; McGahan and Silverman, 2006).

Time constant covariates at the firm and at the innovation-level

Firm age is years since establishment, and *firm size* is a natural log of employees, both in the year of innovation launch. To control for the *innovation geographic novelty*, the following assessment was used: 1 = new to the Finnish market; 2 = new in the regional/local market; 3 = new to European market; 4 = new to the global market. To control for other temporal speed of development, we use *years to domestic commercialization* (year of commercialization minus year of first prototype). To avoid model misspecification and infer unique effects of geographic network balance, we control for two measures used to derive geographic network balance—*foreign network connectedness* and *local network connectedness*.

As foreign and local networks could increase innovation speed and increasing speed could also lead to firms more intensively drawing on local and foreign networks, the choice of balance in local and foreign networks is endogenous. Since the speed of internationalization is conditional on firm performance and capabilities, we control for past performance and innovation as well as operations capabilities.8 Because our outcome measure is censored, logit regression would lead to model misspecification. Therefore, as a feasible solution to maintain validity of duration modelling, while partially controlling for unobserved variables that could lead to simultaneity between networks and speed, we control for past performance. As Bloodgood, Sapienza and Almeida (1996) found sales growth to correlate significantly with internationalization, we control for *compounded sales growth* as well as the *operating profit* (cost of goods sold minus net sales) (Westhead, Wright, and Ucbasaran, 2001) three years prior to commercialization year. As higher percentage of international sales also indicates internationalization capabilities, we use average *percentage of international sales* reported in Bureau Van Dijk three years prior to commercialization as an additional control.

Analytical approach—Cox regression

A venture could export a given product innovation during the observation period (coded as 1), or if the venture did not export its new product innovation, the observation is censored (coded as 0). Traditional logit analysis would require the assumption that firms that did not export during the observation would never export the product, and as such this would be an incorrect assumption for many of the ventures in our sample, as they may export their product innovation at some point in the future. For a discussion of the advantages of event history methods over logit and tobit models, please refer to extensive discussion in Allison (2010). The hazard is explained by a set of time-varying or time-constant covariates.

Our theoretical premise is based on the direct effects of geographic network balance and moderation effects of innovation complexity and industry clockspeed. While parametric specifications such as Weibull regressions helps assess varying effects of direct and moderation effects over time, we do not hypothesize the time-varying hazard rates of these measure. Therefore, we use a semi-parametric Cox regression, which assumes that the effects of independent variables on survival (or the hazard ratios) are constant over time.

Adjusting for self-selection into internationalization

In addition to controls, there could be several unobserved factors that could also affect the speed of internationalization. Ventures that eventually export their innovation could have different unobserved resources and capabilities from those that do not export their innovation. Therefore it is essential to control for self-selection into exporting. Traditionally, Heckman's (1979) two-step self-selection approach uses a series instrumental variable that predicts the likelihood of self-selection using a probit regression. The inverse-Mill's ratio from the probit regression is used as a predictor in the OLS regression in the next step.

Although the speed of internationalization is a censored variable, Heckman specification for limited dependent variables such as censored variables is discussed in Maddala (1986: 267–283), and subsequent econometric models related to self-selection in duration analysis are summarized in Van den Berg (2001). Recent work has controlled for selection for censored dependent variables (Agnew, 2006; Guiso, Sapienza, and Zingales, 2008; Hellmann and Puri, 2002). In the entrepreneurship literature, Eckhardt, Shane, and Delmar (2006) and Delmar and Shane (2006) control for self-selection for survival outcomes. Elsewhere, studies by Billari and Liefbroer (2007), Puranam, Singh, and Zollo (2006), and Xia and Li (2013) use the Inverse Mill's ratio from Step 1 as a control in the Cox regression.

Using Heckman's two-stage model (Heckman, 1979), in the first step we code firms that internationalized their products as 1 (153 firms) and those that did not as 0 (254 firms). Then we used9: (1) industry-median adjusted three-year average percentage of international sales ($r = 0.642$, $p = 0.000$/$r = 0.148$, $p = 0.086$); (2) industry-median adjusted natural logarithm of firm assets ($r = 0.244$, $p = 0.016$/$r = 0.094$, $p = 0.134$); (3) labor productivity or ratio of sales to employees; ($r = 0.192$, $p = 0.035$/$r = 0.072$, $p = 0.121$); (4) absorbed slack ($r = 0.229$, $p = 0.007$/$r = 0.107$, $p = 0.214$); (5) three-year mean industry-level foreign direct investment ($r = 0.442$, $p = 0.000$/$r = 0.105$, $p = 0.215$), as these could all increase the likelihood of internationalizing innovation at a faster rate. The instruments used in the first step are strongly related to likelihood of exporting the innovation, but not strongly related to speed of exporting. The self-selection is based on unobserved heterogeneity related to likelihood of exporting; firms must first self-select into exporting and then focus on the speed of internationalization. Therefore, instruments must be strongly correlated with unobserved heterogeneity related to likelihood of export but weakly correlated with speed of internationalization. We use the Inverse-Mill's ratio from the first step as a control in the main regression.

Results

Table 1 shows the correlations among the variables. We observe low to moderate levels of correlations. All VIFs were less than 3.855, and the condition index did not exceed 7.438. We include a method factor in the measurement model to show relative variance explained by substantive factors and the method factor. The substantive constructs explained 89.42 percent of the variance, and the method factor explained 0.99 percent of the variance. Overall, common method bias was not a significant threat to the validity of findings (Podsakoff *et al*., 2003).

Table 2 shows the results of the Cox Regression. Hypothesis 1, which proposed that geographic network balance increases the speed of internationalization, is supported (Model 2: $\beta = 0.172$, $p < 0.01$). In addition, it is important to note that the model with geographic network balance (Model 2) is significantly different from Model 1 (Δ Wald Chi-square = 7.448 (1), $p < 0.01$). At higher network balance the likelihood of internationalization increases, whereas at lower network balance the likelihood of internationalization decreases.

Hypothesis 2 proposed the moderation effect of innovation complexity on the relationship between geographic network balance and speed of internationalization. While innovation complexity lowers the speed of internationalization (Model 4: $\beta = -0.125$, $p < 0.01$), geographic network balance increases the speed of internationalization at higher levels of innovation complexity (Model 4: $\beta = 0.103$, $p < 0.05$). Thus, our findings support Hypothesis 2. At low levels of geographic network balance, higher levels of innovation complexity lower the internationalization speed over time. Conversely, with increasing geographic network balance, higher levels of complexity increase the likelihood of internationalization over time. The moderation effect of innovation complexity is significantly different from our direct effects model (Δ Wald Chi-square = 7.875 (1), $p < 0.01$).

Industry clockspeed increases the likelihood of speed of internationalization (Model 5: $\beta = 0.314$, $p < 0.01$). Hypothesis 3, which proposed that industry clockspeed increases the likelihood of internationalization over time under increasing geographic network balance (Model 5: $\beta = 0.127$, $p < 0.05$), is also supported, and this moderation effect is significantly different from the direct effects model (Δ Wald Chi-square = 5.366 (1), $p < 0.05$). With increasing geographic network balance, higher levels of clockspeed increase the likelihood of internationalization of the product over time, whereas at low geographic network balance faster clockspeeds lower the likelihood of internationalization of the product.

Post-hoc analysis

Although the Cox regression is a valid specification for the censored outcome of internationalization speed, as a post-hoc analysis to assess if the results are robust to endogeneity, we relax the necessity to model for censored outcome and model internationalization speed as a years to export (=1 if exported, =0 otherwise). Hausman (1978) and Bhagat, Bolton, and Romano (2008: 1879–1880) provide additional explanations on 2SLS versus 3SLS Hausman tests. The Hausman test (H_0: results from 2SLS are the same as 3SLS) is rejected, years to export (*h*-statistic = 32.65, p = 0.00), local network connectedness (*h*-statistic = 23.48, p = 0.00) and foreign network connectedness (*h*-statistic = 28.36, p = 0.00), a 3SLS model is recommended.

Instrumental variables used to identify uniquely each of the three equations in 3SLS must be strongly correlated with the outcome measure, but not strongly correlated with the remaining two outcomes. Instrumental variables used for each equation are specified separately.10 With the exception of vertical relatedness, operationalizations of additional instruments are either explained in the discussion of controls or variables used in the first step of Heckman's self-selection control. Vertical relatedness refers to the degree of input–output relationships with upstream suppliers and downstream buyers. Using OECD Input–output tables, we use Fan and Lang's (2000) measure of vertical relatedness.

We now discuss our rationale for including specific instrumental variables in equations. Firms competing in industries characterized as dynamic (Cadogan, Kuivalainen, and Sundqvist, 2009), as having higher international sales (Wolf, 1977), as having higher mean sales (Bloodgood *et al*., 1996), and as having increased product market competition (Karuna, 2007) are more likely to seek international cooperation. Furthermore, older and larger firms with more innovation and production capabilities are more likely to internationalize (Westhead *et al*., 2001). Firms under increased environmental complexity and munificence are less likely to seek international opportunities (Raven, McCullough, and Tansuhaj, 1994); younger (Shrader, 2001) and smaller firms (Keeble *et al*., 1998) are more likely to seek local partners; and firms with larger market size (Prahalad and Doz, 1999), increased vertical relatedness (Luo, 2002), and higher labor productivity (Aw and Hwang, 1995) are more likely to seek domestic partners.

As strong instruments are more difficult to identify, based on Bhagat *et al*. (2008: 1879) we use a Stock-Yogo test to assess validity of weak instruments (years to export: First stage F-statistic 34.95; foreign network: First stage F-statistic 56.34; local network connectedness: First stage F-statistic 27.18; critical value 11.63). For the vector of instruments to be valid, the F-statistic for each equation must be greater than the critical value for all three equations estimated jointly. The results were consistent with the proposed hypotheses (H1: $\beta = 0.304$, $p < 0.01$; H2: $\beta = 0.194$, $p < 0.05$; H3: $\beta = 0.172$, $p < 0.05$).

Robustness analyses

First, it is also useful to confirm empirically within our dataset the extent to which speed of internationalization correlates with broader firm performance outcomes. The correlation between new product development speed and the three-year average return on sales ($r = 0.56$, $p < 0.001$), three-year average operating profit (net sales − cost of goods sold; $r = 0.46$, $p < 0.001$), and three-year compounded sales growth ($r = 0.35$, $p < 0.01$) was significant. Second, in addition to Weibull regression, our inferences did not change for other parametric distributions (1) Gompertz; (2) log-normal; (3) log-logistic; (4) Weibull; and (5) generalized gamma. Third, we code the four complexity innovation types as described in footnote 3 with high complexity rated 1 and the other three rated 0. The estimates for Hypothesis 2 were consistent in magnitude, direction, and significance ($\beta = 0.148$, $p < 0.01$). Finally, although several studies have used Inverse Mill's ratio as a control in Cox regression, we test the self-selection model using years to export as an outcome variable in OLS regression in the second-step of Heckman's self-selection model. Our results were consistent in direction and significance (H1: $\beta = 0.462$, $p < 0.01$; H2: $\beta = 0.235$, $p < 0.05$; H3: $\beta = 0.149$, $p < 0.05$).

DISCUSSION

The race to internationalize new product innovations is critical for technology-based ventures to take full advantage of and exploit their innovations before their competitors do. The results of our study lend additional insight into the tension between local and foreign networks, which have both been widely recognized as providing important advantages to technology ventures seeking to internationalize. Ventures pursuing a balance of local and foreign network connections for the development of an innovation are able to bring their new product innovations into the international marketplace more rapidly.

Our results also suggest that both innovation complexity and industry clockspeed heighten the importance of geographic network balance to the speed of new product internationalization. That is, when there is a high level of complexity in the innovation being used to develop a new product, relying upon a network that is geographically balanced is more critical for rapid internationalization than when the new product innovation is less complex. Furthermore, when a venture is competing in an industry with high clockspeed, the venture has the benefit of playing on a more level competitive playing field, as established competitors have less ability to protect the competitive advantages of their products. Under these conditions, ventures must be able to internationalize rapidly a new innovation such that it can more quickly recoup its R&D cost and fully exploit the innovation.

We offer a series of contributions. First, we contribute to the international entrepreneurship literature by offering further clarity into the role of a venture's networks in the speed of internationalization of their new product innovations. Specifically, we demonstrate that configuration of both global and local networks needs jointly to be taken into account. In doing so, our study responds to multiple reviews in the literature that acknowledge speed as an important, albeit often neglected, measure of internationalization (Oviatt and McDougall, 2005). Furthermore, we help shed light onto the lack of support received in previous studies that have solely examined the direct relationship between local network collaboration and internationalization (Manolova, Manev, and Gyoshev, 2010).

Second, we contribute to the network literature by reconciling tensions between foreign and local networks. Han and Celly (2008) recently proposed that international new ventures that concurrently pursue paradoxical strategies are able to perform better. While the authors outline two examples, including (1) few investments and many countries and (2) standardization and innovation, we offer yet a third example of the pursuit of both local and foreign network collaboration for innovation, or 'glocalization' (Chen and Tan, 2009).

Lavie and Miller (2008) developed a framework suggesting that, at low levels of alliance portfolio internationalization, firm performance would decrease, as latent national differences may not be adequately recognized. At moderate levels of alliance portfolio internationalization, however, firm performance would increase due to its absorptive capacity and specialized collaborative routines that support the exchange of valuable network resources. Thus, consistent with their findings, our study supports the viewpoint that moderate (i.e., balanced) levels of foreignness will contribute to a specific aspect of firm performance—internationalization speed.

Third, while prior studies have tended to focus on the firm-level implications of new product development, we add to the literature by instead focusing on a venture's product innovation as our unit of analysis. Phene, Fladmoe-Lindquist, and Marsh (2006) concluded in their study of technology-based firms that the simultaneous pursuit of technology across geographic dimensions is not useful in generating breakthrough inventions. However, while our study does not analyze the nature of the invention, we do recognize an alternative advantage to maintaining pursuit of technology across geographic dimensions, namely, a more rapid entry into foreign markets. Thus, technology-based firms need to weigh both the pros and cons of their geographic partner selection.

We believe our study has some practical implications on both the managerial and policy levels. First, our analysis has uncovered that, from a tactical point of view, the innovation development process and product internationalization process should not be isolated domains of managerial decision making because there are temporal implications for internationalization from the network configuration during the innovation process.

Second, our results may be useful for public policymakers seeking to design R&D support programs that target firm growth through innovation. As noted by Pack and Saggi (2006), there are arguments for and against industrial policy relating to the network collaboration of foreign and local firms. While some proponents advocate the role of integrating foreign firms into the production network to leverage their strengths and resources (Coe, Dicken, and Hess, 2008; Pack and Saggi, 2006; Thun, 2004), others clearly argue for the collaboration with proximate firms to create local competitiveness (Amsden, 2003; Hirschman, 1988; Murphy, Shleifer, and Vishny, 1989). In the advent of network-based thinking, public policymakers have incorporated incentives for firms to engage in interorganizational networks during funded innovation projects. Where international venture growth is an objective of such programs, our results suggest that promoting geographically balanced collaboration networks may be instrumental in achieving such goals.

LIMITATIONS AND FUTURE RESEARCH

First, the relationship between networks and internationalization speed could be influenced by the conditions of the host country. For example, the transaction costs and likelihood of opportunism associated with foreign partnerships may be higher for ventures in developing countries and thus limit their effectiveness. We do not consider fine-grained effects of different types of stakeholders distributed across different geographical regions. It is likely that based on country-, industry-, and firm-related characteristics, different stakeholder distribution configurations could be relevant. We call on future research to assess supply conditions, market orientation, cultural distance, psychic distance among others to gain a deeper insight into internationalization speed. Second, although various attempts were taken within the confines of the data, including controls for the size and age of the firm, self-selection controls, and prior international sales, one of the limitations is our inability to control for the existing product portfolio of the new venture or the international experience of the top management team, which has been shown to be a consistent predictor of venture internationalization (Nielsen, 2010).

The limitations of the measurements, their reliability and validity must be further acknowledged. Geographic network balance is a self-report ego-centric based measure that could be more robustly measured through network-centric measures to assess possible advantages and disadvantages resulting from connections among partners. Although the measure of industry clockspeed is well established, the measure of innovation complexity, although not self-reported, is a coarse measure. Future research could focus at the design level to develop more precisely a measure of innovation complexity. Furthermore, the outcome measure of speed of internationalization does not measure breadth or intensity of the internationalization of the focal product. Some ventures would export later due to more countries and with a larger footprint and would thus have a ‘slower’ internationalization speed, whereas certain ventures would export to a single country with a smaller footprint but with higher internationalization speed. Future research could focus on developing more reliable measures within the context of venture internationalization.

Third, Duysters and Lokshin (2011) recently concluded that alliance complexity had an inverse U-shaped relationship to innovative performance. Their arguments were based on the rationalization that although diversity in alliance partners can provide access to a broader pool of knowledge expertise and related synergies, there are associated costs to a complex portfolio of alliances related to management and appropriability.

Fourth, prior work by Coombs, Mudambi, and Deeds (2006), Yu *et al*. (2011), and Coombs *et al*. (2009) focused on the importance of the degree to which a venture is embedded in a cluster to draw benefits of knowledge spillovers and resource sharing in clusters. Although our data did not have sufficient information to model cluster membership and potential resource and knowledge exchanges, future studies could focus on complementarity or substitution between cluster and alliance network in internationalization efforts. Finally, Sasi and Arenius (2008) divide the internationalization process into two phases: early internationalization (aimed at gaining access to global business) and subsequent international/global growth. While our study focused on understanding the role of geographic network balance in the first phase geared toward internationalization speed, future research would benefit by further exploring the implications for subsequent growth and international performance.

CONCLUSION

In conclusion, our study confirms the notion that ventures do not internationalize their newly innovated product alone, but rather as a network. Given the urgency of internationalization to technology-based ventures, we underscore the importance of a balanced collaborative effort between local and foreign partners for innovation development. The criticality of a balanced geographic network is magnified when the venture's new product has a high level of innovation complexity and/or operates in a fast clockspeed industry.

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1. For 121 firms dropped from the sample, we create an Inverse Mill's ratio using control variables listed in the main analysis and an additional control for four-digit NACE code. The inverse Mill's ratio was not significant in the main regression ($\beta = 0.17$, $p = 0.29$).

2. 1995, 96 ventures; 1996, 86; 1997, 48; 1998, 41; 1999, 32; 2000, 29; 2001, 40; 2002, 12; 2003, 11; 2004, 9; 2005, 3.

3. The respondents were asked to evaluate innovation as

1. High complexity: Innovation as a system consisting of several functional parts, with development based on several disciplines (i.e., paper machine, mobile phone network, cruise ship).
2. Medium artefactual complexity/high developmental complexity: Innovation as a unit, with development based on knowledge bases from several disciplines (i.e., pharmaceuticals, software, generator).
3. Medium artefactual complexity/low developmental complexity: Innovation as a unit, with development based on knowledge base from one discipline. (i.e., electronic wheelchair, drill)
4. Low complexity: Innovation as a single coherent unit. (i.e., glue-laminated timber, mobile phone cover).

4. Thirty-one strategic action areas considered were: Customized products; On-time product deliveries; Enhanced customer service; New product introduction; Product development; R&D expenditures; Adapt to new technologies; Fast introduction of products; Product technology focus; Dealer incentives; Alliances with dealers; Advertising; New channels of distribution; Brand promotion; Expansion of marketing programs; Minimum tooling; Low inventory levels; Product delivery on time; Lower production cost; Powerful suppliers; Production rates; Economies of scale; Increase productivity; Lower waste; Production rates; Expansion of manufacturing capacity; Computerized manufacturing; New equipment and facilities; Capital expenditures; Increased outsourcing; Reallocation of existing capacity.

5. Establishment diversity is

$$Establishment\ Diversity_i = 1 - \sum_j^m E_I^2 / \left(\sum_j^m E_i\right)^2$$

where E is the number of establishments in industry I, $j = 1, 2, \ldots m$, and m =number of establishment size classes—small (≤250 employees), medium (250 < employees < 500), and large (≥500 employees).

6. We thank an anonymous reviewer for this suggestion.

7. http://stats.oecd.org/Index.aspx?DatasetCode=PATS_IPC

8. We thank an anonymous reviewer for this helpful suggestion.

9. Correlations with likelihood of internationalization/speed of internationalization.

10.

Speed of internationalization or Years to export (Year of export minus Year of first prototype) = $\beta_0 + \sum_{i=0}^{C} \beta_i$ *Controls*$_i$ + β_2 *Network Balance* + β_3 *Innovation Complexity* + β_4 *Industry Complexity* + β_5 *Network Balance* × *Industry Complexity* + β_6 *Network Balance* × *Industry Complexity* + ϵ *Foreign Network Connectedness* = β_0 + β_1 *Environmental Dynamism* + β_2 *Industry median adjusted % international sales* + β_3 *Mean industry international sales* + β_4 *Product Market Competiton* + β_5 *Market Size* + β_6 *Firm Age* + β_7 *Firm Size* + β_8 *Innovation Capabilities* + β_9 *Production Capabilities* + β_9 *Production Capabilities* + β_{10} *Local Network Connectedness* + ϵ*Local Network Connectedness* = β_0 + β_1 *Environmental Complexity* + β_2 *Environmental Munificence* + β_3 *Market Size* + β_4 *Firm Age* + β_5 *Firm Size* + β_6 *Labor Productivity* + β_7 *Vertical Relatedness* + β_8 *Foreign Network Connectedness* + ϵ

Table 1. Mean, standard deviation, and zero-order correlation

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Environmental complexity	0.571	0.236	1															
2. Mean industry international sales	0.134	0.255	−0.121	1														
3. Market size	11.590	14.684	−0.192	0.344	1													
4. IP protection	0.535	0.246	0.244	0.092	0.081	1												
5. Age	5.70	2.00	0.061	0.065	0.110	0.155	1											
6. Firm size (log of employees)	54.23	14.95	0.122	0.455	0.088	0.196	0.359	1										
7. Innovation geographic novelty	1.37	0.58	0.079	0.264	0.194	0.088	0.050	0.182	1									
8. Years to commercialization	2.146	2.527	0.192	0.188	0.134	0.071	0.068	0.116	0.078	1								
9. Foreign network connectedness	0.193	0.223	0.152	0.086	0.126	0.208	0.100	0.129	0.194	0.053	1							
10. Local network connectedness	0.174	0.292	0.102	0.110	0.127	0.132	0.165	0.138	0.200	0.105	0.072	1						
11. Three-year sales growth	0.057	0.152	0.093	0.485	0.141	0.090	0.159	0.109	0.229	0.192	0.142	0.078	1					
12. Three-year operating profit	0.125	0.246	0.062	0.439	0.056	0.108	0.219	0.238	0.219	0.172	0.074	0.164	0.607	1				
13. % International sales	0.062	0.185	0.273	0.188	0.191	0.080	0.217	0.170	0.096	0.157	0.263	0.139	0.171	0.187	1			
14. Geographic network balance	0.538	0.159	0.063	0.141	0.142	0.186	0.067	0.194	0.135	0.136	0.172	0.204	0.136	0.129	0.142	1		
15. Innovation complexity	2.420	1.317	0.184	0.090	0.181	0.117	0.198	0.170	0.114	0.063	0.061	0.197	0.063	0.237	0.212	0.255	1	
16. Industry clockspeed	2.053	3.463	0.065	0.150	0.121	0.138	0.091	0.149	0.142	0.090	0.184	0.199	0.256	0.065	0.145	0.174	0.239	1
17. Speed of internationalization	0.376	—	0.247	0.198	0.168	0.195	0.133	0.264	0.134	0.161	0.116	0.137	0.127	0.187	0.130	0.192	−0.156	0.126

Notes: N = 407 innovations; all correlations at or above |0.08| are significant at 0.05 or below (two-tailed test); all correlations at or above |0.14| are significant at 0.01 or below (two-tailed test).

Table 2. Cox regression

	Model 1 Controls	Model 2 Hypothesis 1	Model 3 Direct effects	Model 4 Hypothesis 2	Model 5 Hypothesis 3	Model 6 Full model
Intercept	0.769*** (0.154)	0.713*** (0.168)	0.688*** (0.174)	0.673*** (0.182)	0.678*** (0.180)	0.653*** (0.182)
Direct effects						
Geographic network balance [H1]	— —	0.172** (0.064)	0.166** (0.063)	0.162* (0.065)	0.158* (0.062)	0.155* (0.061)
Innovation complexity	— —	— —	−0.130** (0.042)	−0.125** (0.044)	−0.128** (0.046)	−0.123* (0.052)
Industry clockspeed	— —	— —	0.289** (0.102)	0.305** (0.107)	0.314** (0.112)	0.275* (0.126)
Two-way interactions						
Geographic network balance × innovation complexity [H2]	— —	— —	— —	0.103* (0.044)	— —	0.097* (0.043)
Geographic network balance × industry clockspeed [H3]	— —	— —	— —	— —	0.127* (0.052)	0.112* (0.047)
Industry controls						
Environmental complexity	0.146* (0.071)	0.152* (0.075)	0.142* (0.069)	0.154* (0.063)	0.151* (0.066)	0.142* (0.068)
Mean industry international sales	0.146* (0.074)	0.149 (0.079)	0.152* (0.073)	0.149* (0.072)	0.146 (0.078)	0.132 (0.084)
Market size	0.072 (0.049)	0.084* (0.041)	0.065 (0.048)	0.062 (0.043)	0.069 (0.074)	0.076 (0.065)
IP protection	0.048 (0.042)	0.044 (0.048)	0.049 (0.052)	0.042 (0.069)	0.037 (0.064)	0.040 (0.068)
Firm-level controls						
Age	0.021 (0.016)	0.022 (0.018)	0.019 (0.023)	0.024* (0.012)	0.022 (0.014)	0.019 (0.018)
Firm size (log of employees)	0.172*** (0.048)	0.177*** (0.052)	0.182** (0.058)	0.173** (0.064)	0.179** (0.061)	0.161* (0.074)
Innovation geographic novelty	0.147** (0.052)	0.152** (0.055)	0.148** (0.051)	0.136* (0.064)	0.139* (0.066)	0.124 (0.068)
Years to commercialization	0.246*** (0.069)	0.238** (0.074)	0.235** (0.072)	0.240*** (0.072)	0.244** (0.076)	0.229** (0.082)
Foreign network connectedness	0.128** (0.047)	0.117* (0.050)	0.116 (0.062)	0.123* (0.060)	0.118 (0.062)	0.093 (0.048)
Local network connectedness	0.142* (0.066)	0.148* (0.070)	0.136 (0.072)	0.145* (0.067)	0.148* (0.062)	0.135* (0.064)
Three-year sales growth (t − 5 to t − 1)	0.132** (0.047)	0.126* (0.049)	0.122* (0.050)	0.124** (0.047)	0.134* (0.052)	0.131* (0.056)
Three-year operating profit (t − 5 to t − 1)	0.186*** (0.053)	0.181** (0.058)	0.194*** (0.055)	0.199** (0.062)	0.188*** (0.056)	0.172** (0.060)
% International sales	0.168*** (0.044)	0.169*** (0.041)	0.155** (0.048)	0.159*** (0.044)	0.162*** (0.049)	0.155* (0.062)
Inverse Mill's ratio—internationalization	0.175*** (0.032)	0.182*** (0.034)	0.188*** (0.039)	0.162*** (0.044)	0.158** (0.051)	0.162** (0.053)
Wald chi-square	230.191	237.639	248.081	255.956	253.447	257.175
Δ Wald chi-square (Δ df)	—	7.448 (1)**	10.442 (2)**	7.875 (1)**	5.366 (1)*	26.984 (5)***

Notes: $N = 407$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.