

THE ROLE OF ECOSYSTEMS FOR START-UPS: A COMPARATIVE STUDY BETWEEN KOREA AND FINLAND¹

Matthias Deschryvere²

VTT Technical Research Centre Finland LTD, Espoo, Finland

Younghwan Kim

The Science and Technology Policy Institute, Sejong-si, Korea

Abstract:

The strategic importance of innovation ecosystems has received increased attention from both the academic and policy perspectives. However, there is only limited empirical evidence on the importance of these ecosystems from the perspective of younger firms. This study focuses on the role of ecosystems for young innovative companies (YICs) and is based on a unique set of phone survey data from Finland and South Korea. The results are threefold: (i) Finnish YICs participate more actively in ecosystems than Korean YICs; (ii) on average, Korean YICs report to have experienced lower ecosystem impact compared to Finnish YICs; (iii) in both countries, key organizations of the ecosystems are represented on the board of directors in about one-third of the sample firms.

Keywords: *Innovation ecosystem; Start-up ecosystem; Finland start-ups; Korean start-ups; Ecosystem impact.*

1. Introduction

The insight that innovation activities of firms and their success depend increasingly on other actors has led to the introduction of the concept of innovation ecosystems (*Adner, 2012*). Despite the recent interest in innovation ecosystems, the original concept dates back over two decades and refers to a loosely interconnected network of companies and other entities that coevolve capabilities around a shared set of technologies, knowledge, and skills, and that work cooperatively and competitively to develop products and services (*Moore, 1993*). For the purposes of this paper, ecosystems are

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² The author's contact email: matthias.deschryvere@vtt.fi

defined as being characterized by dependencies between the members, by common goals and objectives and by a shared set of knowledge and skills (*Nambisan & Baron, 2013*). Members can be firms but also other stakeholders such as universities, research institutes, financiers, community groups, standards setting organizations, or professional associations.

This study focuses on the role that innovation ecosystems play for young innovative companies. While the vast majority of ecosystem literature focuses on incumbent firms in ICT, little evidence exists on the interaction between younger firms from other industries and the innovation ecosystems they participate in. Our focus is on young innovative companies (YICs) that are expected to have higher levels of turbulence and innovation than their non-innovative counterparts (*Iansiti & Levien, 2004*). In this paper, YICs are defined as firms founded less than eight years ago that have applied to an innovation agency for public funding³.

The analysis is based on a data-set of innovative start-ups from Finland and South Korea, two innovation-driven economies ranked 6th and 14th respectively in the Global Innovation Index (*Dutta, Lanvin, & Wunsch-Vincent, 2015*). Both countries are among the top innovation performers in their respective regions, with their global entrepreneurship index rankings in 2015 being 14th and 28th respectively (*Acs, Szerb, & Autio, 2014*).

The contribution of this analysis lies in improving our understanding on the role of ecosystems for start-ups from a broad range of industries in these two benchmark countries. In the early 2000s, these two countries grew their economies through contributions of global companies such as Nokia (Finland) and Samsung Electronics (Korea). They have since found it difficult to sustain previous levels of long-term economic growth due to external environmental changes such as increasing global competition and the shift in the industrial structure of IT from hardware to software. To overcome these environmental challenges, Finland and Korea are moving from their large company-friendly policies to policies that promote start-ups and grow small-and medium-sized companies (SMEs), especially those in high-tech industries. Consequently, Nokia and Samsung have been replaced by Rovio and Supercell, which are world-famous game companies, and Kakao, which is the biggest mobile messenger in Korea, as leaders for the countries' future growth.

Finland and Korea have common innovation ecosystems features for startups and SMEs in high-tech industries. However, these two countries differ significantly in geography, demography, business environment,

³ See methodology section 4.1 for YIC definition details

market, and culture. Therefore, studying the impact of ecosystems in a comparative country approach enables us to test the generalization of research results of each country and to albeit only partially reveal the role of different innovation systems and cultural contexts. We fill the research gap on how ecosystems impact younger firms (*Tukiainen, Lindell, & Burström, 2014*). In addition, empirical-based analyses on ecosystems enable us to draw policy conclusions.

Our descriptive results show that while the business network activities of Finnish and Korean YICs look similar at first, Finnish YICs feature more complex innovation ecosystem activities. The comparatively smaller Finnish internal market may explain why Finnish YICs depend more on international support than Korean YICs do. On average, the reported impact of innovation ecosystems on firm performance is higher in the Finnish sample than in the Korean sample. While Finnish YICs record impact in the start-up phase, Korean YICs note more impact in the growth phase of the firm development. Unlike the ecosystem impacts, board performance and board diversity is reported to be higher among Korean YICs than in Finnish YICs. Overall, Korean YICs show more narrow networks with strong ties while Finnish YICs show broader networks with weak ties.

The paper first summarizes the key international literature and the ecosystem policy orientation in both countries. It describes the survey data from the sample YICs in Finland and South Korea, and subsequently examines how firm leaders see ecosystems and their characteristics in both countries. In addition, we observe how they assess ecosystem impact and what the performance and diversity of the board of directors look like.

2. Literature background on ecosystems and firm performance

Despite the importance of innovation ecosystems, few contributions (*Adner & Kapoor, 2010*) have explicitly considered value creation and appropriation (*Autio & Thomas, 2013*). The members of ecosystems can create more benefits as a group than alone, and collaborations in an ecosystem are expected to lead to superior performance (*Tencati & Zsolnai, 2009*). The good reputation of an ecosystem may also benefit its residents (*Van der Borgh, Cloodt, & Romme, 2012*). In addition, ecosystem participation may help members better manage unstable environments (*Zahra & Nambisan, 2012*) by providing direction and reducing uncertainty. By mobilizing ecosystem resources, firms can mitigate co-innovation risks upstream and downstream (*Li & Garnsey, 2014*). Due to external economies of scale ecosystem members may further benefit from access to unique ecosystem sources such as networks (*Clarysse, Wright, Bruneel, & Mahajan, 2014; Van der Borgh et al., 2012*) and from cross-

industrial complementarities (*Van der Borgh et al., 2012*). Importantly, additional complementary resources can generate complementary innovations (*Gawer & Cusumano, 2014*). Other stated benefits include easier access to established markets, branding and reputation advantages, access to technical know-how and intellectual property (IP), and better initial public offering opportunities, especially in the case of hub-based innovation ecosystems (*Ceccagnoli, Forman, Huang, & Wu, 2012; Eisenmann, Parker, & van Alstyne, 2009*). In the case of platform-based ecosystems, participation brings potential benefits such as an increase in product variety, lower production and inventory costs, and reduced time to market (*Gawer & Cusumano, 2014*).

While the vast majority of the ecosystem literature analyzes ecosystems from the perspective of focal firms or platforms, little empirical evidence exists on the role of ecosystems for smaller and younger firms (*Autio, Kenny, Mustar, Siegel, & Wright, 2014; Li & Garnsey, 2014; Nambisan & Baron, 2013*). Therefore, in this paper, we focus on the role of ecosystems related to the performance of YICs⁴.

3. Role of ecosystem orientation in Finland and Korean innovation and industrial policy

3.1. Finland policies

Finland innovation policy is characterized by four trends (*Palmberg, 2015*): (i) moving towards broader based policies, (ii) focusing on system-level and ecosystem promotion, (iii) shifting from direct to indirect R&D support, and (iv) re-inventing industrial policy to formulate Innovation Policy 2.0. As the global nature of competition shifted from industries (1980s) to clusters (1990s) and value chains and networks (2000s) to ecosystems (2010s), Finland innovation policy began to redirect a considerable part of its focus on ecosystems with special attention paid to joint value creation, platforms, orchestration, and public-private partnerships.

Finland industrial and innovation policies worked well for a long time, but the financial crisis of 2008 and the subsequent record-long recession required strategic growth policy (*Kosonen, 2016*). According to former CEO of Nokia Jorma Ollila (“Jorma Ollila: Suomi on kuilun partaalla”, 2016), established companies have to learn much more from start-ups, which is a key point that

⁴ In the ecosystem literature, Iansiti and Levien (2004, p. 74) distinguish between four types of firms based on the complexity of the relationships and the level of turbulence and innovation. For higher levels of innovation, a distinction is made between keystone firms or value dominators and the rest, a category of niche firms. The focus in this paper on young innovative firms goes beyond keystone firms.

should lead new policy orientation. For this new orientation, the focus should be on supporting ambitious global ecosystems that are led or supported by Finland firms (*Kosonen, 2016*). This implies that public support decisions for individual firms require an understanding of the ecosystem(s) they belong to. Key policy tools for enabling the development of ecosystems are public procurement of innovation, public-private partnerships, and experimentation. The ultimate aim of ecosystem policies is to raise global attention on and foreign investment in Finland and to boost exports and employment. Second, a policy focusing on “born-global ecosystems” requires a silo that has strong cooperation between different actors, start-ups, medium firms, large firms, RTO’s, universities, different ministries and different support in a holistic approach (*Kosonen, 2016*). According to the Research and Innovation Council, ecosystems that are defined as an extensive and interactive network of many actors are a precondition for global high-class expertise. The role of the public sector and innovation funding will be to promote of the functioning of the ecosystems in current and new growth sectors (*Research and Innovation Policy Council, 2014, p. 20-21*).

3.2. Korean policies

The key to Korea’s success in industrial and economic development over the period of 1960-1980 was the “fast follower” strategy. Choosing several fundamental industries with low-risk tech and products, the Korean government concentrated its limited national resources into these industries in order to lower production costs and secure profit towards national wealth. While this “selection and concentration” strategy helped companies to secure high market shares and keep their product prices competitive, it created an economic inefficiency stemming from the dominance of a few large companies (the chaebol conglomerates). Since 2008 American financial crisis and the subsequent long economic recession, Korean economic and industrial growth has been stunted by market saturation and the stagnation of household disposable income. The limitation of the future growth of large companies negatively affected the growth of employment. In addition, later developing countries with relatively cheap labor, i.e., China and India, are catching up to Korea.

This dramatic change in the global economy and industrial environment compels Korea to move from the fast follower strategy to the “first mover” strategy in order to move up to the next level of in terms of national economic growth. This latter innovation policy requires a different tactic, such as the “creative economy”, the main slogan of the current Korean administration. This approach includes new innovation policy supporting creative start-up businesses that converge science and technology, ICT, and

culture to create new value-added products and jobs. To improve the innovation ecosystem and promote a creative economy, the Korean government is trying to change the education system to cultivate creativity, provide a space for investment capital and transactions, and increase public and private markets for firms.

Intensive support by the Korean government on entrepreneurship and start-up activities dramatically changed the ecosystem for start-ups in Korea in the last half-decade. The number of new start-ups increased from 41,728 in 2008 to 84,697 in 2014, and the number of angel investors grew from 2,608 in 2012 to 6,000 in 2014. The government spent over 2 billion USD for financial support and programs that installed related infrastructure and instilled entrepreneurial culture. Following government efforts, various players in the private sector entered the start-up ecosystem, such as new venture capital companies (VCs), corporate VCs, accelerators for early-stage start-ups, start-up media, co-working spaces for entrepreneurs, and consulting firms for start-ups. This new variety of players in the start-up ecosystem implies that the focus of public policy shifted from large companies to start-ups.

4. Data, methodology and descriptive statistics

4.1. Data and methodology

This analysis is based on firm-level survey data capturing the ecosystem awareness and ecosystem impact of Finnish and Korean innovative start-ups. In Finland (FI) the survey population⁵ consists of all applicants to TEKES (the Finnish Funding Agency for Innovation) over the period 2009-2013. In Korea (ROK), the sample was randomly selected among “venture firms”⁶ and “Innobiz firms”⁷ (in machinery and software industry) with a random sampling of firms in other industries added as a control group. Based on both telephone surveys, we obtained data for 440 YICs, 240 from Finland and 200

⁵ For a summary of the Finnish survey results see Deschryvere, Lehenkari, Oksanen, Rilla, and Still (2015).

⁶ Venture firm is a verified small-sized enterprise by the Government in terms of innovativeness and technological competitiveness. The Venture firm should satisfy the requirements established in Article 2, Item 2, and Clause 1 of the ‘Special Law for the Promotion of Venture Business’. The public verification system of venture firms in Korea is unique such that the system categorizes Korean venture businesses into venture capital investment firms, research & development firms, technical evaluation certification firms, technical evaluation loaning firms, and preliminary venture firms.

⁷ Innobiz is also a verification system operated by the Government. Among small-sized firms which are older than 3 years, the Innobiz firms are accredited by Korea Technology Finance Corporation which is a public agency that considers the firms’ capability of technology innovation, technology commercialization, management and operation, and performance.

from Korea. YICs are defined as firms that are less than eight years old⁸. The YICs cover the ICT industry, the machinery industry, and all other sectors. After merging the survey data to firm-level data from the ORBIS database, our final sample consisted of 424 YICs (*FI: 240; ROK: 184*).

The telephone survey was addressed to decision-makers (CEOs) of innovative firms to improve our scattered understanding on how firms participate in networks and depend on other partners within the ecosystem, how the ecosystem affects the firm (ecosystem impact) and how corporate governance relates to firm development. Before describing the results, we point out the risk that our samples are not representative for the firm population of Finnish and Korean YICs due to possible selection bias. However, we see the value of our data in informing stakeholders about ecosystem awareness and the impact on smaller and younger players beyond incumbents from the ICT sector. In addition, the data of two countries offer an interesting comparison. We further acknowledge that differences between country scores can be driven by a complex set of phenomena, and therefore the interpretation of results have to be made with care.

The questionnaire was designed based on literature from the fields of network, ecosystem, and corporate governance. Questions on ecosystem impact are based on the additionality principles outlined in Falk (2007). Ecosystem impact cannot be straightforwardly measured and it may take a long time before the benefits of belonging to an ecosystem translate into objectively measurable performance changes such as growth in sales and employment. Therefore, we incorporated a set of perceptual measures in our survey that capture the intermediate impact (*Falk, 2007*)⁹. However, the causality between belonging to an ecosystem and experiencing a firm-level effect of the ecosystem is complex. As our data are in essence cross-sectional, our results should be interpreted as associations. Future research with access to panel data could disentangle the complex relationship further.

4.2. Descriptive: size, age, intellectual property rights (IPR), and industry distribution

In this section, the main characteristics of the firms in sample are introduced. The size distribution of the samples for both countries shows that

⁸ For this analysis start-ups are defined as firms that have their date of incorporation (base on ORBIS database) in the period 2007-2014. In the literature there is no clear-cut definition on how to define start-ups and they have been alternatively defined as being maximum 3, 5, 7, 10, 12 years old.

⁹ Impact questions relate to the most important ecosystem the firm participates in. The answers refer to the agreement with 9 statements (from 1 fully disagree to 7 fully agree) on the role of the ecosystem for the network, the innovation, the progress, the market expansion, the market share, the ambition, the collaboration with RTO's, the skills, and the growth of the company.

the majority of the innovative start-ups are small firms. Figure 1 illustrates that in the Finland sample almost 80% of the firms are small (60% in the Korean) that the Korean sample has a greater share of medium-sized firms than the Finland sample¹⁰. Based on more detailed ORBIS data, average employment for the sample firms is thirty-nine employees for Finland and sixteen for Korea while average turnover amount is 5.8 million Euros for Finland and 2.8 million Euros for Korea¹¹. The average net income amounted to 155,000 Euros for Finland firms and 42,000 Euros for Korean firms. Despite the higher average size, Finland YICs have a younger average firm age (4.63 years) than the Korean YICs (5.23 years) in sample.

The comparison of industry distribution also reveals some clear differences between both samples (Figure 2). The Korean sample is dominated by the manufacturing sector (ROK: 57.5% vs. FI: 20%) while the Finland sample has more service sector firms (FI: 29.2% vs. ROK: 3.9%). For other industries such as ICT (FI: 36.3% vs. ROK: 27.9%) and Retail (FI: 8.8% vs. ROK: 8.9%), the shares in both samples are fairly similar.

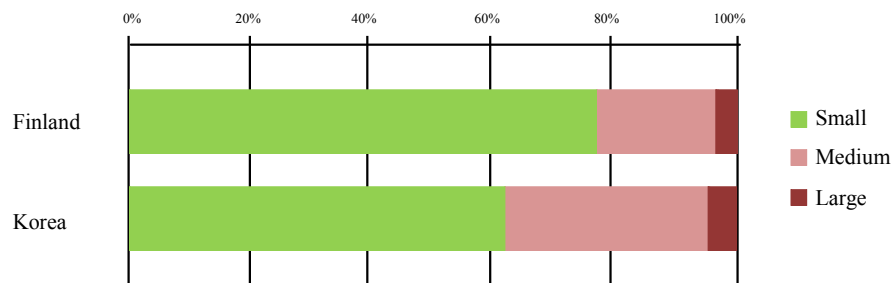


Figure 1. Firm Size Distribution in the Finnish and Korean Samples

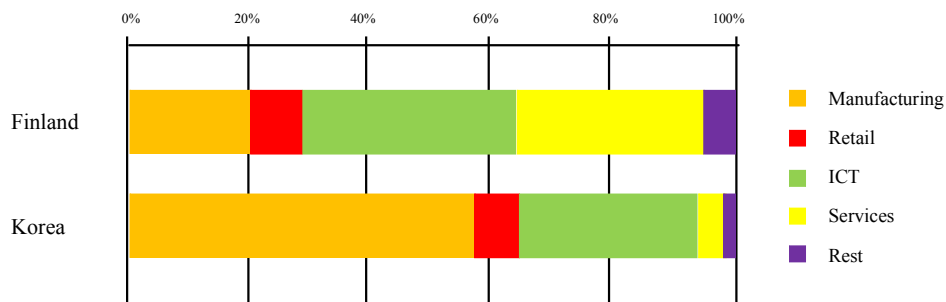


Figure 2. Industry Distribution in the Finnish and Korean Samples

¹⁰ In the ORBIS database, large companies are defined as having an operating revenue \geq US \$13 million (EUR 10 million), total assets \geq US \$26 million (EUR 20 million), number of employees \geq 150 while medium sized companies are defined as having an operating revenue \geq US \$1.3 million (EUR 1 million), total assets \geq US \$2 million (EUR 2 million) and number of employees \geq 15. The companies that are not included in the two categories as described above are considered to be small.

¹¹ Detailed ORBIS data on employment are available for 39% of the Korean sample and 50% of the Finnish sample.

Looking at the IPR information further reveals that the average number of patents is slightly higher for Korean YICs (ROK: 0.99 vs. FI: 0.84). However, both samples have a very similar share of companies (75%) that do not have patents. In the Finland sample, 18% of the firms have trademarks while for the Korean sample the portion is only 1%.

Overall, the above descriptive statistics show that the Korea YICs in the sample are larger and slightly younger on average. This may be due to their higher share of firms in the service sector. Table A1 describes the averages of the survey answers and test results for statistical differences in the means. In addition, Table A1 shows statistical differences on the sample means of Finland and Korea. For the interest of the reader, Table A3 and Table A4 report separate descriptive statistics for the ICT and manufacturing sectors.

5. Firm participation in networks and ecosystems

Despite the rising role of ecosystem awareness in policy and academic circles, there is little evidence on how much firm leaders think in terms of ecosystems and how often firms actually participate in ecosystems. Therefore, the survey first collected information on ecosystem residency¹² of Finland and Korean YICs and on key characteristics of ecosystems (common targets, dependencies, and shared knowledge and skills). In addition, we asked the CEOs about their network activities since they are expected to be more familiar with the network concept.

Figure 3 shows that Finland YICs report that they participate more often in ecosystems than Korean YICs and that they have more complicated and more mature networks than Korean YICs (see the portion of firms participating in multiple ecosystems). In line with our expectations, the data also reveal that broader (innovation) ecosystem residency is more widespread than (business) network residency but that this difference is clearly more pronounced in Finland than in Korea. When looking at network residency in both countries (FI: 55% vs. ROK: 51%), no statistical difference between both countries remains (Table A1). Indeed while 64.2% of Finland firms participate in at least one ecosystem, less than half of the Korean firms (48.4%) do so. The data suggest that Korean YICs belong to more centralized and less connected ecosystems that are driven by large firms or key players.

¹² Ecosystem residency means that a firm stated it belongs to an ecosystem.

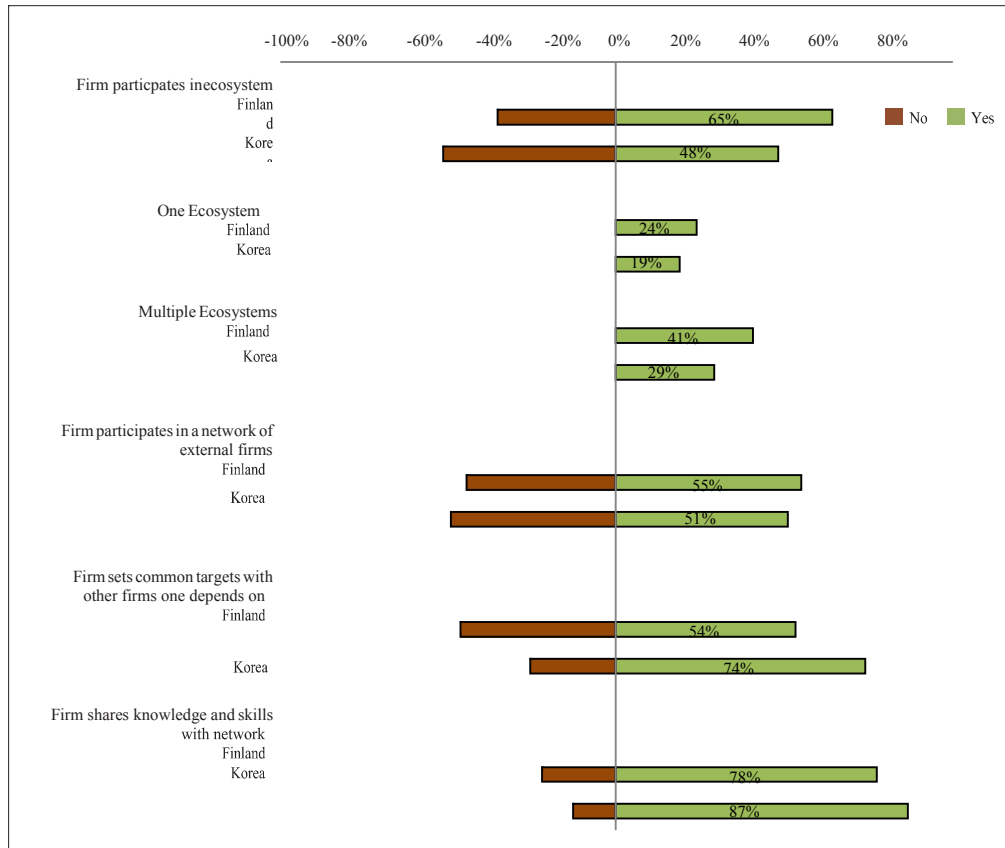


Figure 3. Ecosystem and Network Engagement of Finnish and Korean YICs

Figure 4 shows that the networks where Finland and Korean YICs reside are at different stages of the lifecycle. On average, Finnish networks are further developed. In the Finland sample, more firms reside in growing networks (44%) while in Korea more firms participate in pioneering networks (39%); the only exception is the Korean software industry¹³.

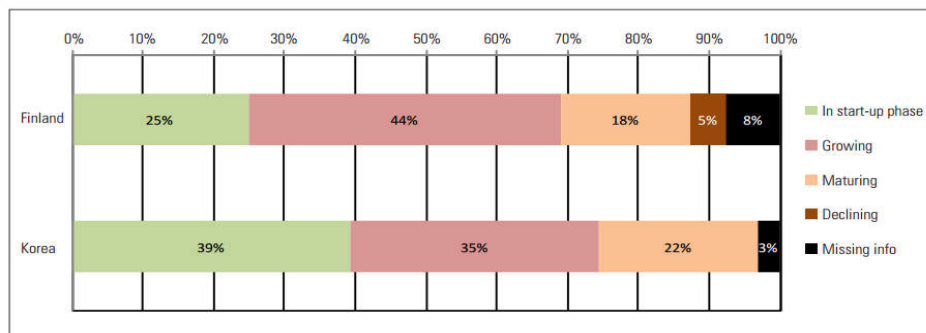


Figure 4. Network development phase distribution of Finland and Korean YICs

¹³ More firms are residing in growing phase (48%) than in pioneering phase (38%) in the Korean software industry.

6. Level of globalization in ecosystems

As a result of network and ecosystem engagement, Finland YICs are more likely than Korean YICs to receiving external support (Figure 5). In both countries, the support of subsidies, loans, and capital from national public financiers (national subsidies) is the most popular and important support channel for start-ups. This finding shows that in both countries the public sector plays an important role in the ecosystem for YICs.

Further comparing the Finland and Korean sample reveals that there are many more VC-backed firms (national and international) in Finland (40.4%) than in Korea (8.7%). This can be explained by the tendency that Korean YICs depend more on national subsidies than on funding from the private sector. This fact can be clarified by several possible conditions such as difference in ease of obtaining private funds for YICs due to a relative portion of public subsidies compared to private sector. However, we would need further analysis to provide the exact reason for the difference in relative dependency on public funds between Finland and Korea.

The much lower dependency on family and friends in Korea is interesting (35.8% in Finland versus 3.3% in Korea). From a cultural perspective, one possible explanation is that the level of risk perception and a fear of failure for start-up activities in Korea is higher than in Finland. The second explanation is related to self-sufficiency. Founders and top managers in Korean YICs are more likely to develop their businesses on their own. On the other hand, Finland YICs are more active in requiring financial resources including their neighbors' help for their firms' growth.

The largest difference between the Finland and the Korean ecosystems is seen in the rate of support by international partners (subsidies and VCs). Only one Korean YIC in our sample receives the support from international VCs and subsidies, while 7.1% of Finland YICs are supported by VCs and public financiers respectively.

This finding shows that Finland has a more globalized ecosystem for start-ups. Finland YICs rely on international business partners to link to international consumers since its domestic market and business environment are small. In contrast, Korean YICs prefer domestic partners to international partners for the growth of their businesses because they have a relatively larger domestic market compared to Finland. The fact that Korean YICs have few international partners is surprising, irrespective of whether Finland YICs are more closely related with the EU market.

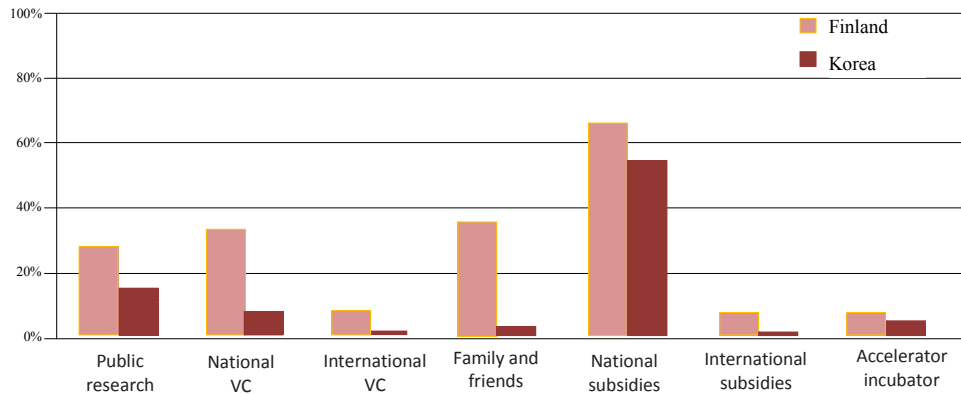


Figure 5. External Supporting Partners of Finland and Korean YICs

7. Impact of the innovation ecosystem

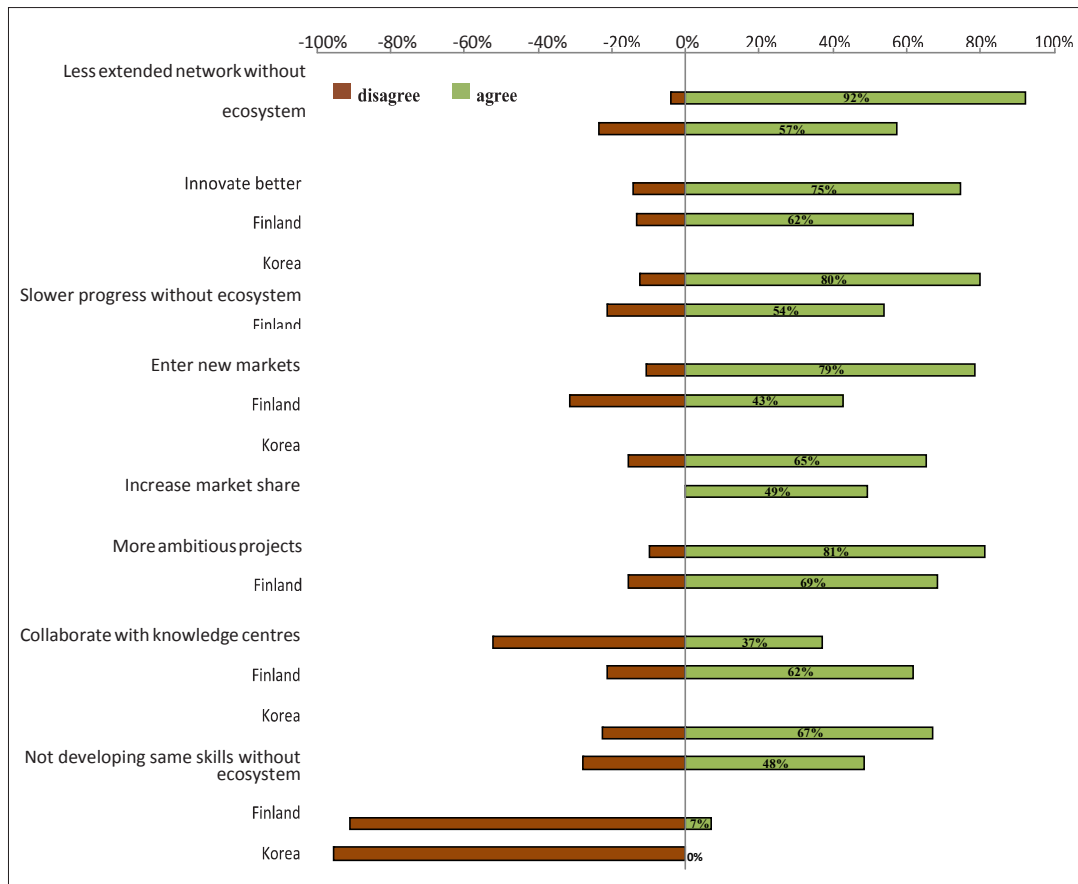
Start-ups usually do not have enough resources for firm growth. Therefore, participation in ecosystems is essential to access capabilities and competitiveness for their business. However, the reasons that start-ups participate in ecosystems vary according to the firm's situation. Because start-ups do not encounter the same problems and obstacles in their operations and management, they expect different impacts and benefits from participation in ecosystems that would serve them.

Figure 6 presents the proportions of two categories: “agree” and “disagree” with statements on the different kinds of 5-year impact of the ecosystem on the YICs. From the results, we find that Korean YICs have a less positive view of the impact of the ecosystem compared to Finland YICs except for “collaboration with knowledge centers” and “limited the growth of the company”. Korean YICs think that the ecosystem is more useful to pursue ambitious projects (69%), innovate better (62%), and collaborate with knowledge centers (62%), while Finland YICs expect that the ecosystem is more helpful for extending their networks (92%), doing ambitious projects (81%), growing their firms faster (80%), and entering new markets (79%).

The largest gap between responses from firms in Finland and Korea exists in the impact of entering new markets (36%), followed by extending networks (35%), and growing faster (26%). Furthermore, clear differences are observed in the ecosystem impact on collaboration with knowledge centers (universities and research centers). As shown in Figure 6, the share of firms in the sample from Korea that said they collaborate with knowledge centers is almost three times larger than those that said they do not. On the other hand, Finland YICs disagree on the impact of collaboration with knowledge centers. The latter finding can partly be explained by differences in the industrial composition of the sample and by differences in the national research support systems for YICs. Comparing industries in Korea, the software sector

disagrees more often with the network statement and the new markets statement than the other sectors. The impact of cooperation with knowledge centers seems to hold more often for manufacturing firms in Korea.

From the results of the ecosystem impact on YICs, we see that Korean start-ups expect *macroscopic and indirect* impact of the ecosystem for upgrading and developing the firm, especially in the growth phase. On the other hand, Finland YICs expect *microscopic and direct* impact of ecosystem for acquiring scarce resources and competitive advantage, especially in the startup phase. However, both Finland and Korean YICs want to conduct ambitious projects by participating in ecosystems. We should carefully interpret these results of ecosystem impact because the differences in the absolute values of the ecosystem impact between Finland and Korea do not perfectly reflect the gap in ecosystem performance between them.



Note: Figure is based on the degree of agreement on nine statements (see left side figure) that were self-assessed by the firms and that refer to the last 5 years. The original Likert scale from 1 (totally disagree) to 7 (totally agree) was simplified into two categories (tend to disagree (1 to 3) and (tend to) agree (5 to 7)).

Figure 6. Comparison of ecosystem impact on YICs between Finland and Korea

While the self-reported impact of ecosystem residency is overall positive, it is of interest to compare the real performance between ecosystem residents and other stand-alone firms. From Table A2, performance in terms of employment, turnover, and profits does not show any strongly significant differences¹⁴. However, in the case of Korean ecosystem residents seem to be bigger than the stand-alone firms in the case of number of employees. This evidence points to the existence of non-linearities in the relationship ecosystem residence and its impact. In this context, there are four types of firms: firms that do not want to belong to an ecosystem because they perform better alone, firms that do not want to belong to an ecosystem but that actually could perform better by belonging to one, firms that belong to an ecosystem and that do well as a result, and firms that belong to an ecosystem but that should not as it harms them. Further analysis with panel data is needed to examine the exact effects of participating in an ecosystem on a firm's real performance.

8. Contribution and diversity of board of directors

Issues on corporate governance concerning top management teams, the board of directors and the advisory board are important in the performance of start-ups (*Daily, McDougall, Covin, & Dalton, 2002; Knockaert & Ucbasaran, 2013; Kor & Sundaramurthy, 2009*). However, there is limited literature on the relationship between board composition, board performance, and ecosystems. In this section, focusing on the diversity and the service performance of the board and board members, we provide comparative results of Finland and Korean start-ups.

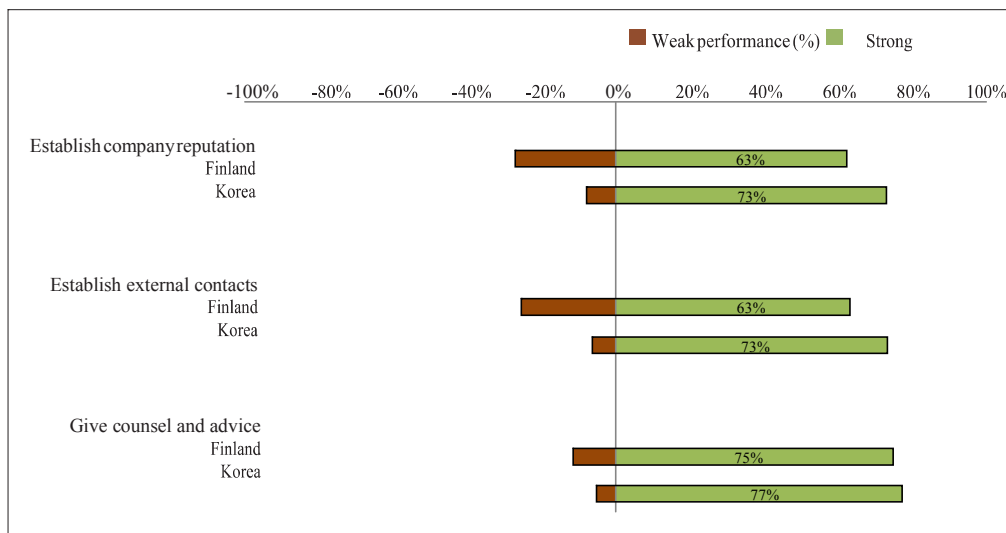
Over half of our Korean firms sampled do not have a board of directors (57.1%) while most of Finland YICs have their own boards (97.1%). On average, there are more people in the top management team and the board of directors of Finland YICs (3.2 and 3.4 people respectively) than of Korean YICs (2.4 and 2.8 people respectively). On the other hand, the average number of inside board members for Korean firms (2.5 people) is greater than for Finland firms (2.2 people).

The share of firms whose most important organizations in the ecosystem are represented on the board is roughly one third of the firms in sample (36.7% in Korea and 31.3% in Finland). However, there are clear differences between the ICT firms and the manufacturing firms in Korea (25.0% vs. 42.9%) and Finland (32.1% vs. 25.7%).

¹⁴ Note that the performance indicator data are not available for all firms in sample. In the case of employment, data are available for 39% of all firms in Korea and 50% of the firms in Finland. Therefore, these results should be interpreted with care.

Comparative results on the service performance of the board of directors turn out to be different to those on the impact of the ecosystem. In other words, Korean YICs have a more positive view on the service performance of the board compared to Finland YICs. We considered three factors for measuring the contribution of the board of directors: enhancing company reputation, establishing external contacts, and giving counsel and advice.

As shown in Figure 7, over 70% of Korean YICs are in favor of a good evaluation of the service performance of their boards. In both countries, the most important service role of the board of directors for YICs is giving counsel and advice. By industry, there is a more positive view in the contribution of the boards among manufacturing firms than ICT firms in both countries. In addition, the boards of directors in the ICT sector score lower on establishing company reputation than in the other sectors in Korea. The board performances of firms in both countries are higher when participating in starting a network than growing a network. During the developmental phase of networks, the role of board members plays a more important and pioneering role in constructing initial networks.

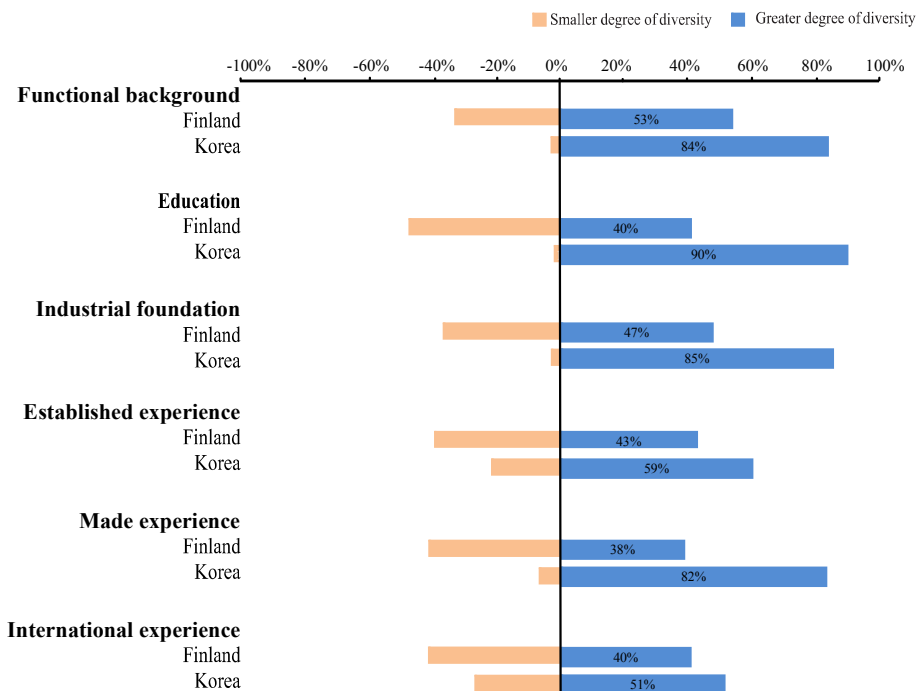


Note: Figure is based on the extent of performance on three statements (see left side figure) that were self-assessed by the firms and that refer to the last 5 years. The original Likert scale from 1 (very small extent) to 7 (very large extent) was simplified into two categories (tend to) weak performance (1 to 3) and (tend to) strong performance (5 to 7).

Figure 7. Service performance of the board of directors in Finland and Korean innovative start-ups

Even if Korean YICs have small-sized boards of directors led by CEOs, they believe in and depend on the capabilities of their boards. This may be caused by the tendency for Korean firms to trust people within their firms over those from the outside. However, Finland firms are more open to those from the outside (i.e., from the ecosystem) and try to find opportunities for growth. In other words, Korean firms are more board-dependent (low level of cooperation), while Finland firms are more ecosystem-dependent (high level of cooperation), as we found from the results of participation in ecosystems.

As shown in Figure 8, Korean YICs have a higher level of board diversity than Finland YICs. The level of diversity of the board members measured in terms of international experience is relatively low in Korean YICs. This finding is consistent with the previous results that show lower levels of international support for Korean YICs.



Note: Figure is based on the degree of diversity on three statements (see left side figure) that were self-assessed by the firms. The original Likert scale from 1 (very small degree of diversity) to 7 (very large degree of diversity) was simplified into two categories (tend to smaller degree of diversity (1 to 3) and (tend to) greater degree of diversity (5 to 7).

Figure 8. Diversity of the Board of Directors in Finnish and Korean YICs

9. Conclusion

This study focuses on the role of innovation ecosystems for start-ups. Through the parallel surveys for YICs in Finland and Korea, we examined the rate of a firm's participation in ecosystems (and networks), the impact of the ecosystem on participating YICs, and the role of the boards of directors in utilizing the ecosystem in terms of corporate governance.

The empirical results from the surveys show that Finland YICs participate in ecosystems more actively than Korean YICs. In particular, considering the portion of firms participating in multiple ecosystems, Finland firms have more connected and complicated ecosystems than Korean firms. On the other hand, no statistical difference in the rate of network participation was found that could be explained by the fact that Korean YICs are more familiar with the concept of networks rather than that of ecosystems.

Most YICs need the support of others for their survival and growth. National subsidies are important for both Finland and Korean YICs. In relative terms, there are more VC backed companies in Finland than in Korea. Of further interest is that there is a much lower rate of dependence on family and friends in Korea due to the fear of failure and self-sufficiency. In addition, we found that Finland YICs more actively find supporting partners (subsidies and VCs) from foreign countries, compared to Korean YICs. The size of the domestic market, business environment, and geographical location (Europe vs. Asia) might be reasons for the difference in the level of dependence on international business partners between two countries.

In terms of the impact of an ecosystem, Finland YICs are more positive than Korean YICs except for the impact of collaboration with universities and research centers. Korean firms think that the ecosystem encourages them to do more ambitious projects, to innovate better, and to collaborate with knowledge centers while Finland firms report that the ecosystem helps their activities that extend networks, pursue ambitious projects, grow the firms faster, and enter new markets. These findings show that Korean YICs expect macroscopic and indirect impacts from the ecosystem in the growth phase of the firm's development while Finland YICs expect microscopic and direct impact of ecosystem in the startup phase. However, from hard performance measures such as employment, turnover, and profits, it is not clear if ecosystem residency is an advantage for the firms. Indeed, firms that report not belonging to an ecosystem may either do better than their ecosystem counterparts or worse but this would require further research taking into account possible selection biases and non-linearities in the relationships.

The results of the contribution and the diversity of the board of directors are different from the results of the impact of an ecosystem. Even though over half of Korean YICs do not have a board of directors, they have a more positive view in the service performance of the board than Finland YICs. In addition, Korean firms have a higher level of the diversity of board members than Finland firms. A higher dependence on the board of directors in Korean YICs is related to the tendency for Korean firms to trust people within their firms over those from the outside. On the other hand, a higher dependence on the ecosystem in Finland YICs is associated with the tendency of Finland firms to try to find opportunities for growth from the outside.

From analysis of the empirical results, we find important policy implications for developing the ecosystems of Finland and Korean YICs. First, Finland YICs try to participate more actively in the ecosystem involving international partners due to a relatively small-sized domestic market and geographical characteristics. In Korea, even though there is a low level of international relationships for start-ups due to a larger domestic market, international networks play an important role for large firms, which consider the expansion of target markets.

In terms of ecosystem participation, a higher level of firm participation in multiple networks in Finland shows that Finland start-ups can acquire resources and capabilities for early-stage growth through various collaborative relations (broad network with weak ties). On the other hand, Korean YICs want to build strong relationships with certain powerful partners within the ecosystem for late-stage growth (narrow network with strong ties). This explanation is consistent with the fact that Korean YICs are older than Finland YICs in our sample.

There are also country differences in terms of the impact of ecosystem. Finland YICs focus on the acceleration of firm growth by acquiring scarce resources and capabilities, and Korean YICs high-light securing the outputs of their innovation activities and growth engines. Therefore, the ecosystems serve different purposes in Finland and in Korea. The ecosystem in Finland is more helpful in marketing and strategic alliances. For Korean firms, participating in the ecosystem can contribute to collaborative R&D activities for development of products and future technologies.

A higher dependence on the board of directors among Korean YICs is closely related to the responsibility for the growth and survival of the firms. The CEOs of Korean YICs have confidence in internal resources and personnel. On the other hand, Finland YICs find opportunity for growth by finding the right balance point within the ecosystem rather than depending on their internal board members.

From the findings presented above, the government of Finland and Korea should build policies for supporting the relative ecosystems for YICs based on the differences in ecosystem participation and the impacts of the ecosystems. The Finland government should support an ecosystem for YICs that pursue relatively long-term collaborative relationships among players within the ecosystem for their innovation and survival. In addition, Finland firms should trust the service roles of the boards and build strategies for growth utilizing their advisory boards.

In Korea, YICs should understand the role of ecosystems in the growth and survival of start-ups in the early-stage of firm development. They should also find solutions for obtaining effective and efficient outcomes through weak ties with various partners within the ecosystem. In addition, the Korean government should promote the globalization of start-ups in the early-stage by supporting activities and programs for entering foreign markets and for making partnerships with international players for funding and other operational purposes./.

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APPENDIX

Table A1. Descriptive statistics of the Korean (ROK) and Finland (FI) samples based on the survey data and two tailed T-tests in means

	Total sample	S.D.	ROK sample	FI sample	Signif.
CEO has founded company (dummy)	0.6998	0.0223	0.375	0.9498	***
CEO's years of experience in the sector (5 categories)	3.1722	0.0688	3.5380	2.8917	***
Firm development phase (4 phases)	1.7901	0.0321	1.8750	1.7250	**
Current public research support receiver	0.2241	0.0203	0.1522	0.2792	***
Current national VC support receiver	0.2241	0.0203	0.0815	0.3333	***
Current international VC support receiver	0.0425	0.0098	0.0054	0.0708	***
Current family and friends support receiver	0.217	0.02	0.0326	0.3583	***
Current national subsidies support receiver	0.6156	0.0237	0.5489	0.6667	**
Current international subsidies support receiver	0.0425	0.0098	0.0054	0.0708	***
Current accelerator and incubator support receiver	0.0613	0.0117	0.0435	0.075	‘
Current support receiver: Missing data	0.1486	0.0173	0.3315	0.0083	***
Firm belongs to network (dummy)	0.5354	0.0242	0.5109	0.5542	
Networks development phase (4 phases)	2.1233	0.0707	1.9255	2.2632	**
Sharing knowledge and skills in networks (dummy)	0.9207	0.0180	0.8723	0.9549	**
Common targets	0.7489	0.0228	0.7447	0.7519	
Belongs to at least one ecosystem (dummy)	0.4837	0.0240	0.4837	0.6417	***
Belongs to an ecosystem: 1 One 2 Multiple 3 None	2.2146	0.038	2.3261	2.1292	**
Ecosystem impact: Less extended network without	5.5744	0.0967	4.6966	6.085	***
Ecosystem impact: Innovate better (from strongly	5.095	0.0994	4.8202	5.2549	**
Ecosystem impact: Slower progress without ecosystem	5.2305	0.1029	4.6404	5.5714	***
Ecosystem impact: Enter new domestic and/or foreign	5.0628	0.1124	4.2360	5.5533	***
Ecosystem impact: Increase market share	4.8390	0.1052	4.3371	5.1429	***
Ecosystem impact: Engage in more ambitious projects	5.2934	0.0969	4.9213	5.5098	***
Ecosystem impact: Collaborate with knowledge centres	4.0333	0.1362	4.7303	3.6225	***
Ecosystem impact: Not developing same level of skills	4.7137	0.115	4.3820	4.9079	**
Ecosystem impact: Limited the growth of the company	1.7984	0.0734	2.0674	1.6429	***
Number of people in Top Management Team (TMT)	2.8670	0.0666	2.4011	3.2455	***
Having a Board of Directors (dummy)	0.7358	0.0214	0.4293	0.9708	***
Size of the Board of Directors	3.2581	0.0766	2.8101	3.4113	***

	Total sample	S.D.	ROK sample	FI sample	Signif.
Number of inside board members in BOD	2.3087	0.063	2.4810	2.2466	*
Number of outside board members in BOD	0.8919	0.0742	0.3291	1.0968	***
Most important organisations of ecosystem are	0.3305	0.0305	0.3671	0.3125	
Board of Directors Performance (from 1 (bad) to					
Board of Directors Performance: Establish company	4.9497	0.107	5.4051	4.7854	***
Board of Directors Performance: Establish external	4.9831	0.1044	5.3038	4.8664	**
Board of Directors Performance: Give counsel and	5.4803	0.0936	5.4937	5.4750	
Board of Directors Diversity (from 1 (small) to 7					
Board of Directors Diversity: Functional background	4.7980	0.102	5.7722	4.4450	***
Board of Directors Diversity: Education	4.3636	0.1116	5.9367	3.7936	***
Board of Directors Diversity: Industry background	4.6879	0.11	5.7975	4.2877	***
Board of Directors Diversity: Founding experience	4.1604	0.1103	4.7089	3.9579	***
Board of Directors Diversity: Executive experience	4.2718	0.1053	5.5696	3.8037	***
Board of Directors Diversity: International	4.0537	0.1079	4.3418	3.9498	+
Having an Advisory Board (ADVB) (dummy)	0.1934	0.0192	0.163	0.2167	‘

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$, ‘ $p < 0.20$.

Table A2. Two tailed T-test results comparing the means of the *ecosystem firms* with the *stand alone firms* in Finland and Korea

	FINLAND (N=240)			KOREA (N=184)		
	Ecosystem Mean	No Ecosystem Mean	Signif.	Ecosystem Mean	No Ecosystem Mean	Signif.
FIRM PERFORMANCE						
Number of employees	54.9459	13.1087		21.6857	10.4324	*
Operating revenue (Turnover) (thousand EUR)	8317.1961	1281.5000	‘	1997.4643	3520.5571	
Profits/Losses for period [=Net income] (thousand EUR)	270.7086	-53.1429		-19.2857	91.0571	‘
Total assets (last year) (thousand EUR)	3958.7351	904.5595		2058.8596	2096.6714	
SUPPORT						
Current public research support receiver	0.3377	0.1744	***	0.2472	0.0632	***
Current national VC support receiver	0.3701	0.2674	*	0.1011	0.0632	
Current family and friends support receiver	0.3896	0.3023	‘	0.0562	0.0105	*
Current national subsidies support receiver	0.6883	0.6279		0.6629	0.4421	***
Current international subsidies support receiver	0.0974	0.0233	**	0.0000	0.0105	
Current accelerator and incubator support receiver	0.0779	0.0698		0.0787	0.0105	**
STRATEGY						
Sharing knowledge and skills in networks	0.8741	0.5890	***	0.9254	0.7407	**
Firm reports to have targets	0.6986	0.2338	***	0.7761	0.6667	
BACKGROUND CEO (RESPONDENT)						
CEO has founded company	0.9346	0.9767	+	0.3034	0.4421	*
CEO's years of experience in the sector	2.9870	2.7209	+	3.3596	3.7053	*
CORPORATE GOVERNANCE						
Number of people in Top	3.3851	2.9737	**	2.5730	2.2366	**
Number of people in the Board of Directors	3.5298	3.1875	*	2.8000	2.8235	
Board of Directors Performance (from small to big extent):						
Establish company reputation	4.9577	4.4675	*	5.4667	5.3235	
Establish external contacts	4.9716	4.6711		5.4444	5.1176	
Give counsel and advice	5.6567	5.1061	*	5.4444	5.5588	

Board of Directors Diversity (small degree 1 to high degree 7):						
Functional background	4.5915	4.1711	+	5.6667	5.9118	
Education	3.9930	3.4211	**	5.9556	5.9118	
Industry background	4.5245	3.8421	**	5.7556	5.8529	
Founding experience	4.0500	3.7838		4.1778	5.4118	***
Executive experience	3.8112	3.7895		5.1556	6.1176	***
International experience	3.9930	3.8684		4.0444	4.7353	*
Firm has an external advisory board (AB)	0.2468	0.1628	+	0.2472	0.0842	***
Importance of AB compared to BOD: for company reputation (1 (7): AB (BOD) outperformed BOD (AB))	4.1351	3.7143		5.0909	5.6250	
Importance of AB compared to BOD: for advice (1 (7): AB (BOD) outperformed BOD (AB))	3.6486	2.5385	**	5.3182	5.8750	

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$, ' $p < 0.20$.

Table A3. Descriptive statistics of the ICT sector sub-samples based on two tailed T-tests in means

ICT sector	KOREA (N=50) Mean	FINLAND (N=87) Mean	Signif.
PERFORMANCE			
Number of employees	9.9048	5.8947	**
Operating revenue (Turnover) (thousand EUR)	859.4688	363.1149	***
Profits/Losses for period [=Net income]	19.0323	-135.7791	**
Total assets (last year) (thousand EUR)	709.5000	398.2907	+
SUPPORT			
Current national VC support receiver	0.1400	0.3333	***
Current international VC support receiver	0.0200	0.0805	*
Current family and friends support receiver	0.0400	0.4023	***
Current international subsidies support receiver	0.0000	0.0460	**
STRATEGY			
Firm reports to have targets	0.7333	0.4405	***
Belongs to at least one ecosystem	0.5200	0.6207	
ECOSYSTEM IMPACT (1: disagree fully, 7: agree fully)			
Less extended network without ecosystem	4.2692	5.8889	***
Innovate better	4.5385	4.8679	
Slower progress without ecosystem	4.1154	5.3519	***
Enter new domestic and/or foreign markets	3.6154	5.5185	***
Increase market share	4.1923	5.1132	**
Engage in more ambitious projects	4.5769	5.1887	+
Collaborate with knowledge centres	4.1538	3.1569	**
Not developing same level of skills without	4.2692	4.3962	
Limited the growth of the company	2.4615	1.7222	***
CORPORATE GOVERNANCE			
Firm has an external Advisory Board	0.1400	0.2529	+

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$, ' $p < 0.20$.

Table A4. Descriptive statistics of the manufacturing sector sub-samples based on two tailed T-tests in means

Manufacturing sector	KOREA (N=103) Mean	FINLAND (N=48) Mean	Signif.
PERFORMANCE			
Number of employees	18.7174	17.5417	
Operating revenue (Turnover) (thousand EUR)	2405.9778	2637.0833	
Profits/Losses for period [=Net income]	-61.6087	-142.2083	
Total assets (last year) (thousand EUR)	2353.9783	1848.0833	
SUPPORT			
Current national VC support receiver	0.0217	0.5000	***
Current international VC support receiver	0.0000	0.0833	‘
Current family and friends support receiver	0.0000	0.2917	***
Current international subsidies support receiver	0.0217	0.1250	‘
STRATEGY			
Firm reports to have targets	0.8000	0.3889	***
Belongs to at least one ecosystem	0.4348	0.6667	*
ECOSYSTEM IMPACT (1: disagree fully, 7: agree fully)			
Less extended network without ecosystem	4.9500	6.0000	*
Innovate better	4.8500	5.2500	
Slower progress without ecosystem	4.6000	5.5000	+
Enter new domestic and/or foreign markets	4.0500	5.4375	**
Increase market share	4.4000	4.6875	
Engage in more ambitious projects	4.8500	5.2500	
Collaborate with knowledge centres	4.6500	4.3750	
Not developing same level of skills without	4.1500	5.1875	+
Limited the growth of the company	1.8000	1.6875	
CORPORATE GOVERNANCE			
Firm has an external Advisory Board	0.1087	0.2083	

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, + $p < 0.15$, ‘ $p < 0.20$.