The role of technological innovation activity and technological networking in export performance path of Born-global firms

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Abstract

The purpose of this study is to identify the role of technological networking and technology innovation activities as a factor affecting foreign markets performance of BG companies. Hypotheses were established between four latent variables, and a total of seven hypotheses were established including the mediated effects of technological innovative activity. A total of 192 questionnaires were collected. Of these, 183 were used as the final sample, except for the nine questionnaires that were not responded to and insincere responses. The empirical analysis of this study used smartpls3.0, a structural equation modeling tool. The empirical analysis of this study revealed that the impact of public sector technological networking on export performance was not significant while all other hypotheses showed statistically significant results. As a result of the mediated effects analysis, technological innovation activity showed a full mediated effect between export performance and technological networking in public sector. In addition, Technological innovative activity has had a partial mediated effect between
export performance and technological networking in private sector. The results of the analysis suggest that born-global firms should concentrate on technological innovative activity.

**Key Words**: Born global, Network based view, Technological innovation activity, Technological networking, Export Performance

1 INTRODUCTION

Born-global (BG) refers to companies that enter foreign markets as soon as they are established (Rialp et al., 2005). Unlike companies that are expanding into foreign markets based on the results of technological innovation through continuous research and development, BG companies are active in entering foreign markets despite the lack of resources. Research on BG companies has been carried out variously from the background of the company to the performance determinants.

Considering the characteristics of BG companies, recent researchers have conducted studies using the knowledge learning viewpoint as a determinant of their performance. Nevertheless, there are a number of stances that BG companies’ performance is derived from the technological differentiation advantage (Neubert, 2016). If there is an ownership advantage for differentiation technologies, the motivation to enter the foreign market may increase, and it may be active in creating performance utilizing technology-based competitive advantage. We believe that BG companies have such technological advantages as well, so they have entered into foreign markets based on this. At the same time, some researchers have concluded that BG companies have made efforts to build local networks that complement scarce resources and have shown results (Monferrer et al., 2015). There are two types of networks that BG companies can build: public and private. Local technological barriers and technical standards can be overcome through the use of public sector technology networks. At the same time, private sector technology network can help to develop products that reflect customer needs.

This study tries to identify the role of external technological networking and technology innovation activities as a factor affect-
ing activities in foreign markets by BG companies with limited resources and size. Accordingly, the purpose of this study is as follows: First, we empirically analyze the role of technology innovation activities and technology networks in creating export performance in foreign markets. Second, we analyze the utilization of technology network into public and private sectors. Third, we discuss the theoretical and policy implications of technological innovation activities and the use of technology networks in BG companies.

2 THEORY AND HYPOTHESES

A. Technological networking

A network based view categorizes the size of the external network that influences business performance and the capacity to form it. Network utilization refers to the ability to expand external networks and promote relationships. A high degree of network utilization means that various networks can be constructed that can be used externally. So far, many researchers have analyzed the reason why network utilization is important when targeting new technological niches like BG companies through empirical analysis. The results are as follows.

First, it is possible to expand the scope of available technology resources by expanding external networks. Companies with diverse networks are more likely to acquire technology resources that are difficult to invest on their own. Technology networks also include technology transfer and R & D support based on government support.

Second, the expansion of various technology networks can increase the possibility of capturing new opportunities to utilize technology innovation. Securing a technology network increases the likelihood of accessing information or opportunities that are less accessible than competing firms (Sullivan Mort and Weerawardena, 2006). As networks become more diverse and stronger, they are more likely to pursue the effects of external organizations and technology interactions. In this process, they can reinforce the innovation activities required for existing technologies.

Third, there is a high possibility that localization will be successful due to network enhancement. The start-up foreign companies
have difficulties in producing and distributing products suitable for local market due to lack of local market information. Companies that have formed a diverse network can shorten this difficulty time they face (Moen and Servais, 2002). This is because it is possible to accumulate local information in a short period of time by cooperating with local partners and have the resources and capabilities needed locally.

B. Technological innovation activity

Industries in the BG industry generally exhibit knowledge /technology intensive characteristics. It is important to create technology-based competitive advantage in the industry. Technology-driven BG companies often have unique technologies and high ownership advantages (Cavusgil and Knight, 2015). A high level of ownership advantage means that they have an exclusive area for their technology. The technological capabilities of technology-led BG companies are also well suited to niche market strategies. Since market power can be achieved through economies of scale or large-scale resource inputs, BG companies that do not have this capability prefer a niche market strategy that can generate comparative advantage.

The followings are the conclusions from researchers who analyzed BG firms’ technological innovation activities: First, technology innovation activities of BG companies are related to ability to change their technology and reunite with external information in terms of competition in technology/knowledge intensive industries. Therefore, it is important to develop new products to cope with the activities of competitors and the response of local customers. BG companies’ technological innovation activities help one flexibly utilize existing technologies to actively respond to environmental changes and achieve results (Sharma and Blomstermo, 2003). While traditional internationalization companies are pursuing market expansion by using general-purpose products, technology-led BG companies are opening new markets with technology innovation products.

Second, BG companies pursue rapid technological innovation activities along with steady internationalization in order to avoid technological barriers in overseas markets. Technological barriers are one of the non-tariff barriers to trade, a kind of technical regulation that governments use to protect their own industries.
If competition is intense in technology-intensive industries like BG companies, the government imposes technological barriers that are difficult to avoid in order to protect domestic markets and help domestic firms grow. Before these technological barriers take place, BG companies quickly acquire overseas markets and then focus on activities to acquire technical standards in the target market and to innovate existing technologies.

C. Hypotheses

a. Technological networking, technological innovation activity and performance

The BG research on the dynamic capability perspective analyzes the phenomenon of internationalization using analytical models that integrate entrepreneurs, resources, networks, and knowledge (Freeman et al., 2006). Dynamic capacity is an activity that links resource characteristics and strategies, affecting the process of reuniting and renewing existing resources at the individual and organizational levels. In particular, technological innovation activities, which are the core of the dynamic competency, mean activities to relocate and combine existing technology capabilities of BG. Technology innovation activities, which are factors of this dynamic capacity, affect overall BG activities.

Technology innovation activities require the input of sufficient resources and time because it aims to induce change in existing resources and to create local competitive advantage. Considering the BG characteristics, it is rare to have enough resources to independently derive the outcomes of technology innovation activities. Although BG is enthusiastic about entering the overseas market immediately after its foundation, there are often insufficient resources to support it. Therefore, BG research has pointed out the importance of using local network. Local networks are a source of information, resources and new opportunities for technology development and innovation (Azar and Ciabuschi, 2017). As technology innovation progresses vigorously, local resources and information that enable technology development and innovation are needed. This is why BG management emphasizes external networks.

The external networks formed by BG can be categorized into local public sector partnerships and private sector partnerships. The public sector helps to gain information and resources that can shape
the technological innovation activities through ties with local government organizations. The private sector network helps to acquire information about local customer needs and market changes. The private sector network is useful for developing localized products based on this. As such, there is a possibility of enhancing technological innovation capacity by building an external technology network and more so especially when there are insufficient resources like BG companies. Therefore, we set the following hypothesis.

**H1:** Technological networking of the public sector of BG companies will positively influence technological innovation activities.

**H2:** Technological networking of the private sector of BG companies will positively influence technological innovation activities.

Technology networks increase the ease with which a resource-starved enterprise executes its strategy. Especially, it will be a burden to a startup company when it has to carry out a high level of resource commitment like overseas market entry. Due to size and resource constraints, it is difficult for startup companies to devote sufficient resources to overseas markets. BG companies that use technology networks do not recognize this difficulty as a barrier because they are establishing founders and organizational external networks in the public and private sectors.

The technology network type BG companies’ motivation to enter the overseas market is to acquire new technology and opportunities in the market by utilizing the existing network (Chetty and Campbell-Hunt, 2004). Public sector networks are based on high trust and mutual commitment in that they are established at government level. Startup entrepreneurs who want to use the public sector technology network try to gain the benefits of the network by increasing the availability of technology innovation activities. The benefits of the private sector technology network include complementing the scarce resources of BG companies and strategic alliances with partner companies. Strategic alliances have the advantage of reducing the risk associated with increased investment costs while using partner technology resources jointly.

As such, the use of technology-related networks can have a positive impact on BG firm performance. This is because localization
technology and products can be developed using external networks. Both public and private sector networks can supplement deficient resources and accept local technology to help improve existing products. As with BG companies, where there is a size and resource constraint, local networking can help find new opportunities and drive localization strategies accordingly. Therefore, we set the following hypothesis in relation to network factors and BG company export performance.

H3: The public sector technological networking of BG companies will have a positive impact on export performance.

H4: The private sector technological networking of BG companies will have a positive impact on export performance.

b. Technological innovation activity and performance

BG companies’ technological innovation activities are very important considering the difficult conditions in economies of scale. BG’s technological innovation activities play an important role in developing and supplying specialized products required for niche marketing. BG often does not have the resources to form a system that enables large-scale product supply. Their competitiveness is to supply technically differentiated products that are tailored to local customers. If technological change is as severe as in advanced manufacturing industries and competition with global companies is intense, the sooner the localization becomes, the higher the performance will be. It is necessary to take action to bring changes to existing technologies and products taking into account local special circumstances. It is so, because without a strategic approach that takes into account local characteristics, it is difficult to secure a competitive advantage locally (Knight and Cavusgil, 2004).

Technology innovation activities correspond to dynamic competence factors and include activities to supplement and rework existing resources. In the case of BG, it is necessary to establish strategies based on specialized products rather than supplying various products in the process of approaching overseas markets. Given the nature of BGs that target niche markets, innovation in existing technologies and products is related to creating a sustainable competitive advantage. Considering these circumstances, technological
innovation activities will have a positive impact on the export performance of BG. Numerous studies have addressed this point and also argue that technological innovation is a source of BG competitive advantage. Therefore, we set the following hypothesis.

H5: BG firms’ technological innovation activities will have a positive impact on export performance.

c. Mediated effects of technological innovation activity

Previous studies have found that technological innovation activities have a direct impact on export performance. They also found that strengthening network capabilities would improve the performance of resource-starved start-ups (Sui and Baum, 2014). Both arguments have in common that they consider the nature of start-ups lacking resources. BG is also influenced by its performance from technology innovation activities and external networks in that it has these characteristics. Technology innovation activity, which is also a dynamic competence factor, is one of the main factors in creating sustainable competitive advantage when considering these BG characteristics, and is influenced by external technological networking to acquire external information and resources necessary for technology innovation activities.

If we consider the relationship between technological innovation activity and network formation, it can be assumed that an external network is needed to realize technological innovation activities through innovation-oriented activities of the organization. In other words, the development of technological innovation affects the export performance of the BG company by utilizing the technical knowledge acquired through the construction of the external network. At this time, external technological innovation activity is a mediator linking BG’s technology network and export performance. Because of this, BG firms are influenced by the information and knowledge gained from the public and private sector networks in the process of localizing their innovations. Through the public sector, it helps to acquire knowledge that reflects local technical standards, and through the private sector network, it helps in distribution and marketing. As a result, it can be hypothesized that the use of local network influences the export performance of BG as a mediating factor. Therefore, we set the following hypothesis.
H6: There will be a positive mediated effect of technological innovation activities between BG company’s public sector network utilization and export performance.

H7: There will be a positive mediated effect of technological innovation activities between BG company’s private sector network utilization and export performance.

Based on the analysis of the theoretical background and the review of existing literature, the empirical analysis model is set as shown in *Figure 1*. Based on the analytical model, hypotheses are set up. Hypothesis setting mediates network factors between innovation activity and export performance. We categorize the mediated effects of network factors into public and private parts and set up a total of 7 hypotheses including them.

**FIG. 1. RESEARCH MODEL**

## 3 RESEARCH METHOD

### A. Measures

#### a. Independent variables

The independent variable in this study is technological networking, which is divided into public sector and private sector. The use of technology networks means working with external organizations to acquire the necessary knowledge and resources. According to the existing studies (Rialp et al., 2005; Moen and Servais, 2002; Freeman et al., 2006), the use of technology network in the public
and private sector was measured by each of the four items using the 7-point scale. First, as for public sector, ① We form a network for acquiring skills with local government research institutes. ② We have established a technical cooperation network with local university research institutes. ③ We complement the scarce resources using the local public sector technology network. ④ We tend to pursue new opportunities through technical cooperation with public sector networks. As for private sector, ① We try to form partners for technology localization. ② We try to acquire and utilize technology related information from our local partners. ③ We seek technical cooperation with local competitors if necessary. ④ We pursue new opportunities through private parts networks including local companies.

b. Mediated variable

The mediated variable in this study is technological innovation activity. Existing research defines technology innovation activity as ability to reorganize and change existing technology. Companies with high technological innovation activities value activities that combine and transform existing technologies and new knowledge. According to the existing studies (Cavusgil and Knight, 2015; Sharma and Blomstermo, 2003; Knight and Cavusgil, 2004), the following 5 items were measured on a 7 point scale: ① We emphasize continuous change in existing technologies. ② We have a high ability to combine external knowledge with existing technology. ③ We have a high ability to innovate and develop new products. ④ We continue to learn external knowledge that helps us to innovate existing technologies. ⑤ We are building an innovation culture throughout the organization.

c. Dependent variable

The dependent variable of this study is export performance. As a start-up, BG has limitations in measuring performance based on financial data. Therefore, existing research (Cavusgil and Knight, 2015; Sui and Baum, 2014) on BG has used subjective satisfaction index for export performance. This study also examined the export performance satisfaction with 5 items using the 7 point scale. Those are: ① We are satisfied with the overall export performance over the past two years. ② We are satisfied with the growth rate of exports over the past two years. ③ We are satisfied with export profitability over the past two years. ④ We are satisfied with our
export performance compared to our competitors over the past two years. We are satisfied with the rate of increase in exports over the past two years.

B. Sample

This study focuses on BG companies, and therefore analyzes the companies that are engaged in export activities right after the start of business. The companies that started export activities within three years immediately after start-up were selected based on data from Korea International Trade Association(KITA) and Korea Chamber of Commerce and Industry(KCCI). In addition, this study has targeted companies that have been exporting for more than two years. The selected population sample was 1,123, and the survey was conducted according to the following procedure.

First, the validity of the questionnaires was secured through consultation with industry and academia experts. Second, when selecting companies to be surveyed, the industrial groups was set as a high technology and manufacturing sectors. This is because the existing research has found BG companies to belong mainly to these industries. Third, a survey page was built based on google docs. Fourth, we requested cooperation of investigation through e-mail, telephone, etc. and sent the link on their e-mail. Fifth, the survey was conducted for four months from January 2016.

After the survey, a total of 192 questionnaires were collected. Of these, 183 were used as the final sample, except for the nine questionnaires that were not responded to and answered badly.

4 RESULTS AND DISCUSSION

This study set up a path model between four latent variables. Hypothesis testing of path models should use structural equation analysis. Therefore, this study used a partial least square(PLS) method (Wold, 1996), which is useful for analyzing the correlation between latent variables based on existing theories.

A. Validity and reliability

The latent variables used in this study are 4, and the manifested variables are 18. Since this study used multiple manifested variables, the reliability and validity analysis were conducted. The
analysis was confirmed by confirmatory factor analysis (CFA). As a result of the analysis, the factor loading value, average variance extract value and composite reliability value of manifested variables for each latent variable were derived. <Table1> below shows the CFA results of the analytical model. As a result, the factor loading value of all manifested variables were more than 0.5, which means there is no problem. Also, the AVE and CR values are both above the criteria values of '0.5' and '0.7'.

TABLE I
THE RESULT OF CONFIRMATORY FACTOR ANALYSIS

<table>
<thead>
<tr>
<th>Path</th>
<th>Factor loading</th>
<th>S.E</th>
<th>T-value</th>
<th>AVE</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU1 --&gt; NU</td>
<td>0.808</td>
<td>0.088</td>
<td>9.172***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NU2 --&gt; NU</td>
<td>0.782</td>
<td>0.096</td>
<td>8.143***</td>
<td>0.510</td>
<td>0.803</td>
</tr>
<tr>
<td>NU3 --&gt; NU</td>
<td>0.636</td>
<td>0.126</td>
<td>5.041***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NU4 --&gt; NU</td>
<td>0.568</td>
<td>0.116</td>
<td>4.882***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR1 --&gt; NR</td>
<td>0.944</td>
<td>0.006</td>
<td>149.099***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR2 --&gt; NR</td>
<td>0.973</td>
<td>0.004</td>
<td>264.047***</td>
<td>0.908</td>
<td>0.975</td>
</tr>
<tr>
<td>NR3 --&gt; NR</td>
<td>0.962</td>
<td>0.005</td>
<td>187.705***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR4 --&gt; NR</td>
<td>0.938</td>
<td>0.010</td>
<td>92.617***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI1 --&gt; TI</td>
<td>0.872</td>
<td>0.019</td>
<td>45.524***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI2 --&gt; TI</td>
<td>0.902</td>
<td>0.016</td>
<td>57.151***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI3 --&gt; TI</td>
<td>0.931</td>
<td>0.010</td>
<td>92.098***</td>
<td>0.741</td>
<td>0.741</td>
</tr>
<tr>
<td>TI4 --&gt; TI</td>
<td>0.877</td>
<td>0.024</td>
<td>36.310***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI5 --&gt; TI</td>
<td>0.713</td>
<td>0.028</td>
<td>25.311***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP1 --&gt; EP</td>
<td>0.923</td>
<td>0.009</td>
<td>99.582***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP2 --&gt; EP</td>
<td>0.908</td>
<td>0.011</td>
<td>81.227***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP3 --&gt; EP</td>
<td>0.914</td>
<td>0.011</td>
<td>82.988***</td>
<td>0.838</td>
<td>0.838</td>
</tr>
<tr>
<td>EP4 --&gt; EP</td>
<td>0.918</td>
<td>0.010</td>
<td>93.141***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP5 --&gt; EP</td>
<td>0.915</td>
<td>0.012</td>
<td>78.644***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NU= technological networking in public sector, NR= technological networking in private sector, TI=technological innovative activity, EP= export performance, ***=p<0.001, **=p<0.01, *=p<0.05

Next, the discriminant validity analysis was conducted for showing the degree of distinction between latent variables in the analytical model. The discriminant validity is determined by comparing
the square root of AVE and the correlation coefficient of each latent variable. If the comparison result shows that the former is larger than the latter, it is considered that there is no problem in the validity of the discrimination (Fornell and Larcker, 1981). <Table 2> below shows these results. Therefore, it was confirmed that there is no problem in the reliability and validity of the manifested variable.

**TABLE II**
**THE RESULT OF DISCRIMINANT VALIDITY**

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>NU</th>
<th>NR</th>
<th>TI</th>
<th>EP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU</td>
<td>0.714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td>0.430</td>
<td>0.953</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>0.482</td>
<td>0.563</td>
<td>0.861</td>
<td></td>
</tr>
<tr>
<td>EP</td>
<td>0.448</td>
<td>0.766</td>
<td>0.654</td>
<td>0.915</td>
</tr>
</tbody>
</table>

**B. Common method bias and model fit**

The common method bias problem appears when the survey method is varied. CMB problems can lead to over-fitting problems in the analysis results. It is not easy to prevent this in any survey study. Therefore, it is checked whether CMB is generated as a post-verification method. In this study, marker variable (MV) input method be provided by Lindell and Whitney (2001) was used. If the correlation coefficient with existing latent variable is less than 0.75 after inputting arbitrary MV, it is considered that there is no CMB problem. <Table 3> below shows the results of these analyzes.

**TABLE III**
**THE TEST OF COMMON METHOD BIAS**

<table>
<thead>
<tr>
<th>Latent variables</th>
<th>NU</th>
<th>NR</th>
<th>TI</th>
<th>EP</th>
<th>M-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>NU</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td>0.450</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>0.482</td>
<td>0.563</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP</td>
<td>0.448</td>
<td>0.766</td>
<td>0.654</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>M-V</td>
<td>0.168</td>
<td>0.365</td>
<td>0.312</td>
<td>0.366</td>
<td>1.000</td>
</tr>
</tbody>
</table>

NU=technological networking in public sector, NR= technological networking in private sector, TI=technological innovative activity, EP= export performance, M.V= marker variable

Next, we examined the model fit index presented in the PLS structural equation model. In the PLS SEM, R2, variance inflation
factor (VIF), and standardized root mean square residuals (SRMR) for dependent variables are presented as shown in <Table 4>. If the Adj-R2 is more than 0.25 and the VIF is less than 10 and the SRMR is less than 0.08, then it is considered that there is no problem.

**TABLE IV**

<table>
<thead>
<tr>
<th></th>
<th>VIF</th>
<th>Adj-R²</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR</td>
<td>1.229</td>
<td>1.583</td>
<td>0.049</td>
</tr>
<tr>
<td>NU</td>
<td>1.207</td>
<td>1.368</td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>1.632</td>
<td>0.381</td>
<td></td>
</tr>
<tr>
<td>EP</td>
<td></td>
<td>0.656</td>
<td></td>
</tr>
</tbody>
</table>

NU=technological networking in public sector, NR= technological networking in private sector, TI=technological innovative activity, EP= export performance

C. Hypotheses testing

Hypothesis testing of the structural equation model is performed through path analysis. The path analysis results can be used to check whether statistical significance is present by presenting regression coefficient values and standard errors. <Table 5> below shows the path analysis results of the empirical analysis model of this study. The analysis revealed that the impact of public sector technological networking on export performance was not significant while all other hypotheses showed statistically significant results. Therefore, other hypotheses were supported except Hypothesis 3.

**TABLE V**

<table>
<thead>
<tr>
<th>H</th>
<th>Path</th>
<th>Path coefficient</th>
<th>S.E</th>
<th>T-Value</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>NU -&gt; TI</td>
<td>0.311</td>
<td>0.063</td>
<td>4.963***</td>
<td>S</td>
</tr>
<tr>
<td>H2</td>
<td>NR -&gt; TI</td>
<td>0.428</td>
<td>0.061</td>
<td>7.018***</td>
<td>S</td>
</tr>
<tr>
<td>H3</td>
<td>NU -&gt; EP</td>
<td>0.043</td>
<td>0.060</td>
<td>0.714</td>
<td>N/S</td>
</tr>
<tr>
<td>H4</td>
<td>NR -&gt; EP</td>
<td>0.564</td>
<td>0.054</td>
<td>10.418***</td>
<td>S</td>
</tr>
<tr>
<td>H5</td>
<td>TI -&gt; EP</td>
<td>0.313</td>
<td>0.058</td>
<td>5.380***</td>
<td>S</td>
</tr>
</tbody>
</table>

NU=technological networking in public sector, NR= technological networking in private sector, TI=technological innovative activi-
ity, EP= export performance, ***=p<0.001, **=p<0.01, *=p<0.05

Next, the mediated effect hypothesis was tested. In the PLS analysis, the mediated effect can be examined using the effect decomposition method. Effect decomposition shows path analysis results including mediating variables. This result is divided into total effect, direct effect, and indirect effect. If the total effect is significant and both the direct effect and the mediated effect are significant, then it is considered that there is a partial mediated effect. On the other hand, if the direct effect is not significant and only the indirect effect is significant, it is considered that there is a complete mediated effect. <Table 6 > below shows the effect decomposition results. According to the previous discussion, Hypothesis 6 showed a fully mediated effect, and Hypothesis 7 showed a partial mediated effect.

**TABLE VI**
THE RESULT OF EFFECT DECOMPOSITION

<table>
<thead>
<tr>
<th>H</th>
<th>Path</th>
<th>Total effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Mediation effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>H6</td>
<td>NU-&gt;TI-&gt;EP</td>
<td>0.140 (0.057)</td>
<td>0.043 (0.066)</td>
<td>0.097 (0.025)</td>
<td>Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.472**</td>
<td>0.714</td>
<td>9.904***</td>
<td></td>
</tr>
<tr>
<td>H7</td>
<td>NR-&gt;TI-&gt;EP</td>
<td>0.079 (0.054)</td>
<td>0.564</td>
<td>0.134</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17.602***</td>
<td>10.418***</td>
<td>4.044***</td>
<td></td>
</tr>
</tbody>
</table>

NU=technological networking in public sector, NR=technological networking in private sector, TI=technological innovative activity, EP= export performance, ***=p<0.001, **=p<0.01, *=p<0.05, Numbers in bold are path coefficient values. The values in parentheses is the standard error. Numbers in italics are t-values.

**D. Discussion**

This study examines the effects of technological networking and technology innovation activities in public and private sectors on export performance. As a result of the empirical analysis, the use of external networks has a positive effect on technological innovation activities. This suggests that technological networking is useful as a localization strategy. Although the development of technology
innovation activities is aimed at localization, BG companies often do not have enough resources to cope with them. Technological networking complements the scarce resources and information of these BG companies. In addition to supplementing the resources, technological networking in the public/private sector affects the acquisition of knowledge necessary for continuous technological innovation. Therefore, the analysis suggests that Korean BG companies should focus on establishing local public/private sector networks.

Regarding the relationship between technological networking and export performance, public sector networks appeared to have no direct impact on export performance. This means that there is no achievement in utilizing the public sector network, and the Korean BG companies are also vulnerable to this. Public sector technology networks help to overcome technical standards with non-tariff barriers. Despite these facts, the results of the analysis indirectly suggest that Korean BG firms are faced with difficulties in actively responding to public sector technological networking. The results of this analysis suggest that Korean BG companies need to develop their own capabilities or support at the government level to complement these realities.

Technological innovation activities have had a positive impact on the export performance of BG companies. This is the same result as existing studies (Knight and Cavusgil, 2004; Azar and Ciabuschi, 2017). These results show the characteristics of BG firms that appear mainly in the new technology industry, even though they have limited resources and size. BG companies try to enter overseas markets based on unique technologies and create results. It can be seen that Korean BG companies also increase their export performance through continuous innovation activities.

The mediated effect analysis showed that the technological innovation activities had a full mediation effect on the public sector technological networking, which had no direct effect. This result implies that the continuous development of the innovation activities connects the public sector’s technological networking with the export performance. Technological innovation activities have also been found to have a sector mediation effect on private sector technological networking. This demonstrates that the innovation activity is a concrete capability to link external technology networks to export performance. The results of this analysis suggest that it
is important to continue the technological innovation activities in enhancing the performance of external technological networking.

5 CONCLUSION

This study analyzed the results of external technological networking and technology innovation activities for Korean BG companies. The results of the analysis showed the importance of external technological networking and the role of technology innovation activities. In particular, identifying the mediated effect of technological innovation activities is meaningful in suggesting practical implications for Korean BG firms. The theoretical implication of this study is that the network based view and the dynamic capability view discussed in the existing BG study are integrated to construct the empirical analysis model and the network factors were divided into public and private and verified the difference of influence. As a result of this study, some of the characteristics of the relationship between technological networking and technological innovation activities were revealed considering the characteristics of BG companies. In addition, we can observe the reality of Korean BG companies that are not yet familiar with public sector technological networking. Therefore, in future research, meaningful attempts will be made to expand and analyze the relationship between technological networking and technology innovation activities for BG companies. This study provides important implications in that it examines the role of local technology networks on BG firms with resource and size constraints and the effects of technology activities. Technological networking has been influential in overcoming the resource limitations of BG companies and developing sustainable innovation activities. It also turned out that innovation activities contribute to improving export performance by leveraging the resources and knowledge gained from these external technology networks. As a result, Korean BG companies need to concentrate on building and utilizing active local networks centered on technology innovation activities.

Despite these implications, this study has the following limitations and suggests the following research directions. First, this study has limitations in analyzing the performance of BG firms only
in terms of export performance. In addition to export performance, BG companies enter overseas markets to achieve various goals. For example, they go overseas to gain local market information and build relationships with local customers. Future research will need to analyze the performance of BG companies in various aspects.

Second, this study has limitations in that it does not consider factors of organizational learning that are known to affect technological innovation activities. Even when a similar level of resources, such as organizational learning, is put into technology, it also serves as a factor to reveal the difference. In future studies, it is necessary to carry out empirical analysis integrating factors of knowledge based view considering this point.

References


