

The Role of Open Innovation Ecosystems in the Internationalization of Born Global Firms: A Resource-based Perspective

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Abstract

Innovation is a key catalyst for born global firms (BGs) to enter international markets. However, resource-constrained BGs face significant challenges in overcoming resource limitations during innovation and rapid internationalization. An open innovation ecosystem (OIE) offers a cost-effective approach, enabling firms to leverage external resources, foster innovation, and enhance their chances of successful international expansion. Therefore, grounded in Resource-based Theory, this study adopts a multiple case study approach and semi-structured interviews to explore the role of OIE in the internationalization of BGs. The study finds that the OIE serves four roles in the internationalization of BGs: resource synergy platform, innovation empowerment, international opportunities catalyst, and capabilities enhancer. The findings enhance the understanding of innovation strategies in the internationalization of BGs, clarify the role of OIE in supporting this process, and provide practical insights to guide decision-making for BGs entrepreneurs.

Keywords: open innovation ecosystem, born global firms, rapid internationalization, product innovation, open innovation

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1. INTRODUCTION

The internationalization of born global firms (BGs) is characterized by rapid speed and entry into multiple international markets (Yang & Stoian, 2025; Zahra & George, 2008). Still, it is highly risky and hindered by resource scarcity resulting from the liabilities of newness, smallness, foreignness, and outsidership (Anand et al., 2023; Cavusgil & Knight, 2015). In response to unfamiliar environments, rapid technological advancements, and time constraints, BGs place a premium on innovation strategies to enhance performance in dynamic and complex markets (Knight & Cavusgil, 2004; Sui et al., 2023). Specifically, innovation accelerates BGs' internationalization, enabling BGs to shorten product life cycles and rapidly penetrate international markets (Prashantham & Young, 2011; Hilmersson et al., 2017). Firms that innovate at a faster pace are also more likely to develop flexible capabilities and adaptive routines, which will reduce switching costs and facilitate the quicker identification and exploitation of international market opportunities (Hilmersson et al., 2017; 2023). Moreover, a high level of innovation allows firms to enter multiple foreign markets simultaneously, thereby distributing innovation costs across markets and mitigating the risks associated with international expansion (Khavul et al., 2010; Terjesen et al., 2016). However, from a resource-based perspective, the innovation process is resource-consuming, and most BGs cannot cover all the innovation activities necessary to develop and commercialize an innovation successfully (Chabbouh & Boujelbene, 2020). Moreover, both innovation and internationalization require resources, and it is challenging for resource-constrained BGs to deal with innovation and rapid internationalization (Kraus et al., 2017; Moogk, 2012; Zijdemans & Tanev, 2014).

As the context of open innovation (Xie & Wang, 2021), the open innovation ecosystem (OIE) allows ecosystem actors to open their boundaries to participate in innovation and connect the resources and innovative products of each ecosystem actor to obtain economies of scale and scope (Alam et al., 2022). Collaboration, as a key element of OIE, provides channels for the flow of resources, knowledge, and opportunities (Bembom & Schwens, 2018), which contributes to innovation development and cost sharing (Al-Tabbaa et al., 2019), and makes the innovation of SMEs cost-effective, flexible and externally dependent (Heaton & Min, 2025; Lekovic et al., 2020). Therefore, participating in an OIE helps BGs cope with the resource scarcity challenges faced in the process of rapid internationalization (Zahoor et al., 2020). Additionally, support from an OIE enables ecosystem actors to integrate new knowledge with their existing expertise while uncovering business opportunities in foreign markets (Hilmersson et al., 2023; Johanson & Vahlne, 2009). By bridging external resources, the open innovation approach reinforces innovation strategies and facilitates internationalization (Simba et al., 2024). This process also enhances the likelihood of successful international expansion (Gurău et al., 2020; Aliaga-Isla & Rialp, 2013).

Existing perspectives on the innovation approaches of BGs include the lean startup approach (Blank, 2013), accelerated innovation (Hilmersson et al., 2023; 2017), and business model innovation (Johansson & Abrahamsson, 2014). The lean startup approach enables BGs to develop minimum viable products by engaging in open innovation with external actors (Zijdemans & Tanev, 2014). The business model design focuses on the commercialization of innovations, thereby contributing to firms' international performance (Kraus et al., 2017). The accelerated innovation perspective examines the relationship between BGs' internationalization and innovation timing and speed (Hilmersson et al., 2023; 2017). However, existing research overlooks the contradiction between innovation and early internationalization and fails to address the resource constraints faced by BGs that achieve early internationalization through innovation.

Based on the above arguments, this study claims that the OIE provides an effective innovation approach for BGs to achieve rapid internationalization and solves the problem of the insufficient resources between innovation and rapid internationalization. However, research on OIE in international entrepreneurship is still in the early stages (Fallah, 2022), and the role of OIE in the internationalization of BGs needs to be further explored. Therefore, this study intends to explore the following question "What is the role of an open innovation ecosystem in the internationalization of BGs?"

The insufficient focus on the role of OIE in the internationalization of BGs restricts the theoretical scope of international entrepreneurship research, confining it to traditional and overexploited perspectives, such as learning (Guo & Wang, 2021; Prashantham & Young, 2011; Tuomisalo & Leppäaho, 2019), networks (Coviello, 2006; Zahoor et al., 2020), and entrepreneurship (Lin & Si, 2019; Oviatt & McDougall, 2005; Pawęta, 2015). Moreover, innovation strategy is the main driver of the rapid internationalization of BGs and an OIE provides an effective innovation approach to explain the rapid internationalization of BGs (Chetty & Campbell-Hunt, 2004; Gurău et al., 2020). Explaining the internationalization phenomenon of BGs from the perspective of OIE not only responds to scholars' call to introduce an in-depth and holistic innovation

ecosystem perspective into the field of international entrepreneurship (Zahoor *et al.*, 2020; Zahra & Nambisan, 2012) but also provides rich insights into the research on the innovation approach of the internationalization of BGs (Hilmersson *et al.*, 2023; Liu *et al.*, 2022).

Driven by the research question, this study deploys a multiple case study approach and semi-structured interviews to gather data from four born global firms in China, aiming to explore the role of OIE in their internationalization. The results are anticipated to enhance understanding of innovation strategies in the internationalization process of BGs, clarify the role of OIE in supporting this process, and offer practical insights for decision-making by BGs entrepreneurs.

2. LITERATURE REVIEW

2.1 Internationalization of Born Global Firms

Born global firms refer to "entrepreneurial start-ups that, from inception or near inception, seek to generate a substantial portion of their revenues by selling their products in international markets" (Knight & Cavusgil, 2004 p.124). By definition, born global firms are born with a global vision and often achieve internationalization within a short period after their inception (Knight & Cavusgil, 2004; Weerawardena *et al.*, 2007). Therefore, previous scholars refer to the internationalization of BGs as "rapid internationalization" (Cavusgil & Knight, 2015), "early internationalization" (Li *et al.*, 2012), or "accelerated internationalization" (Weerawardena *et al.*, 2007). However, the internationalization of BGs is highly risky and is hampered by resource scarcity. The resource scarcity problem and mortality are exacerbated in BGs compared with other types of international businesses (Hughes *et al.*, 2019) due to the overlapping effects of the liabilities of newness, smallness, foreignness, and outsidership (Anand *et al.*, 2023; Cavusgil & Knight, 2015). The above liabilities result in a shortage of resources, especially knowledge, opportunities, human and financial resources (Cavusgil & Knight, 2015; Zahoor *et al.*, 2020).

Previous literature indicates that innovation is a primary driver of the rapid internationalization of BGs (Chetty & Campbell-Hunt, 2004; Falahat *et al.*, 2020; Haddoud *et al.*, 2023). Innovation enables BGs to offer unique products that target market segments requiring flexibility and further serves as a key factor in their rapid internationalization success (Malodia *et al.*, 2023; Paul & Rosado-Serrano, 2019; Kim *et al.*, 2011). By seeking and acquiring product innovation, the internationalization of BGs can be accelerated because product innovation shortens the production life cycle, increases innovation intensity, and gives BGs a high capability to enter international markets (Zonta & Amal, 2018).

2.2 Open Innovation Ecosystems

An open innovation ecosystem is defined as an innovation ecosystem where the primary goal of stakeholders is to implement open innovation initiatives (Xie & Wang, 2020). An OIE allows the resources of ecosystem actors to flow across organizational boundaries, achieving the generation and diffusion of innovation jointly (Xie & Wang, 2020). From a resource-based perspective, resource acquisition motivates ecosystem actors to engage in OIE (Liu *et al.*, 2022). The OIE paradigm of start-ups highlights the importance of collaboration in driving innovation success (Fallah, 2022). Through cooperation with other actors, ecosystem participants not only acquire and learn experiential knowledge but also identify and capitalize on opportunities in foreign markets by integrating new insights with their existing knowledge base (Hilmersson *et al.*, 2023; Johanson & Vahlne, 2009).

Within OIE, the integrator incorporates niche solutions from complementary ecosystem actors to offer holistic or customized products by combining components or technologies from multiple providers (Song, 2022; Bosch-Sijtsema & Bosch, 2015; Tabas *et al.*, 2023). It is evident from previous studies that common actors in OIE include universities, users, and business partners. In addition to the above, the unique actors like incubators, venture capital companies, accelerators, and research institutions, are emphasized in start-ups' OIE when considering the uniqueness of start-ups. The meta-synthesis of prior literature identifies key actors in the start-up OIE, including "major customers," "major competitors," "firms and businesses," and "innovation and creation centers" (Fallah, 2022). Ecosystem actors act as the knowledge-flow actors within OIE. The interaction between them facilitates knowledge transfer (Bacon *et al.*, 2019) and innovation advances (Xie & Wang, 2020).

2.3 Born Global Firms, Innovation and Open Innovation Ecosystems

Innovation is thus viewed as one of the most important requirements for the survival of BGs and the key to distinguishing BGs from others (Cavusgil & Knight, 2015). Innovation facilitates companies' adherence to various international regulations, mitigating operational risks and fostering improved stakeholder relationships (De Marchi, 2022). However, the innovation process is resource-consuming, and BGs cannot cover all the innovation activities necessary to successfully develop and commercialize an innovation (Chabbouh & Boujelbene, 2020). So, the specific problem faced by BGs is that it is challenging for BGs with scarce resources to deal with resource-consuming innovation and complex rapid internationalization simultaneously (Kraus et al., 2017; Moogk, 2012; Tanev et al., 2015).

OIE aims at innovation development and commercialization jointly, allowing the innovation in ecosystem actors to be cost-effective, flexible, and externally dependent (Lekovic et al., 2020). This innovative community supports open innovation activities by promoting collaboration between ecosystem actors with heterogeneous knowledge bases, wherein the exchange of knowledge flow is more open and agile (Gimenez-Fernandez et al., 2022). The OIE establishes an environment conducive to open innovation activities, facilitating innovation through these practices. Specifically, OIE enhances the platform capabilities of central enterprises, such as their capacity for integration and reconstruction, which subsequently exerts a positive influence on their innovation (Wang et al., 2023). In the internationalization area, the open innovation method supports the internationalization of firms not only by bridging external resources to accelerate innovation but also by enhancing successful opportunities for international expansion (Zahoor et al., 2022; Aliaga-Isla & Rialp, 2013; Gurău et al., 2020). Therefore, this study argues that participation in an OIE can help BGs address resource scarcity challenges (Zahoor et al., 2020), particularly for those pursuing rapid internationalization through innovation strategies.

Based on the above review, prior research published in the *International Journal of Business Science & Applied Management* and related fields has firmly established the innovation perspective within the domains of international SMEs and entrepreneurship, with particular emphasis on SMEs' sustained growth (Nimfa et al., 2021) and international performance (Ahmad et al., 2021). However, despite these valuable insights, a significant gap remains in understanding the resource scarcity challenges faced by BGs that pursue internationalization through innovation strategies.

To address this issue, and in response to scholarly calls for a more in-depth and holistic perspective on innovation ecosystems within the field of international entrepreneurship (Zahoor et al., 2020; Zahra & Nambisan, 2012), this study adopts Resource-based Theory to explore the role of OIE in the internationalization process of BGs. In doing so, it seeks to fill this critical gap and advance the understanding of how innovation strategies can be effectively leveraged in international entrepreneurship. The findings of this study will: (1) enrich the literature on innovation approaches in the internationalization of BGs from the perspective of OIE; (2) clarify the role of OIE in addressing the resource scarcity challenges faced by BGs during internationalization; and (3) advance knowledge of OIE within the field of international entrepreneurship research. From a practical perspective, the study will offer actionable insights for international managers of BGs on how to enhance global competitiveness through open innovation practices. It will also guide innovation managers in leveraging OIE to achieve more efficient and cost-effective innovation. Furthermore, OIE may serve as valuable sources of international resources, supporting both value creation and value capture for BGs.

2.4 Resource-based Theory

Resource-based Theory proposes that resources constitute a firm's competitiveness, including the idea that "all assets, capabilities, organisational processes, firm attributes, information, knowledge, etc., controlled by the firm enable the firm to plan and implement strategies to increase efficiency and effectiveness" (Barney, 1991, p.101). This early definition emphasized the point that the internal resources owned and controlled by a firm are the basis for a source of competitive advantage. However, the dynamism of the international environment requires firms to constantly adjust their resource base to adapt to the rapidly changing environment by developing and utilizing resources (Hilmersson & Hilmersson, 2021), especially for BGs that need to gain the required resources within a limited time under the congenital defect of resource scarcity (Bembom & Schwens, 2018). Therefore, the extended Resource-based Theory argues that the complementary resources acquired through external partners are also a source of competitive advantage for firms (Dyer & Singh, 1998; Lavie, 2006).

Innovation is one of the most important requirements for survival and development as well as the key to distinguishing BGs from others (Cavusgil & Knight, 2015; Sui et al., 2023). In addition, innovation can shorten production life cycles, increase innovation intensity, and consequently enable BGs to enter international markets (Zonta & Amal, 2018). However, BGs are not well equipped to manage the innovation process and achieve early internationalization goals as they face the resource scarcity challenge resulting from the several liabilities (smallness, foreignness, newness, and outsidership) (Edwards et al., 2005; Moogk, 2012). Scholars have thus called for an ecosystems perspective to explain the international entrepreneurship field (Zahoor et al., 2020; Falahat et al., 2023). Deriving from Resource-based Theory, OIE provide resource support to the ecosystem actors (Xiong et al., 2022), transforming the inputs of ecosystem actors into new products, facilitating the achievement of product innovation effectively (Zhao & Yi, 2023). OIE enable BGs to leverage external resources to achieve innovation by promoting resource flow, aggregation, and integration within the ecosystems (Xie & Wang, 2020). As this study posits that participation in the OIE helps BGs address resource scarcity during rapid internationalization, the Resource-Based Theory is adopted as the theoretical foundation.

3. METHODOLOGY

To minimize external variations and improve generalizability, a multiple case study method is adopted. This approach facilitates comparative evaluation across diverse contexts for a more comprehensive understanding of the complex phenomenon of BGs internationalization and enables in-depth analysis of empirical evidence for theory development or extension (Eisenhardt, 1989). In case studies aimed at theory development, sample selection follows the logic of theoretical sampling based on conceptual relevance rather than representativeness (Miles & Huberman, 1994). The sample size was determined by previous scholars in similar theoretical contexts and research paradigms (Boddy, 2016). Therefore, consistent with the approach of Rialp et al. (2005), this study adopted purposive sampling and theoretical replication logic to guide sample selection and interviewee identification. Four case companies are selected for this study. The selection criteria for the case firms are based on the widely accepted definition of BGs (Knight & Cavusgil, 2004), using the following case selection criteria: 1) the firm started international operations within three years of its founding; 2) international sales accounted for more than 25% of total revenue; 3) the firm was an active participant in an OIE.

3.1 Data Collection

Semi-structured interviews are the primary data collection method for this study, allowing for in-depth and detailed information on the BGs' international activities and OIE to be gathered from participants (see Table 1). At least three interviewees (including the founder, the international manager, and the innovation manager) are selected for each case firm to capture rich data from different perspectives. The number of interviewees for each case depends on the data saturation. This study follows the interview protocol during the interview process, which has been considered a tool to ensure the quality of interviews (Castillo-Montoya, 2016) because the interview protocol ensures that the interview questions are aligned with the research questions and are conducted in a fluent and moderately open manner (Yin, 2018). In the interview protocol of this study, non-guiding descriptions are usually followed by closed questions to verify the given information and explore further aspects (see Appendix 1). The entire interview process was audio-recorded and transcribed verbatim, and an object-oriented database was established to store the subjects' interview data and evidence from all other sources. It is worth mentioning that the data collection process of this study adheres to ethical standards, and all respondents participated voluntarily based on informed consent, and the researchers also signed a commitment letter to ensure the anonymity and confidentiality of the data (Castillo-Montoya, 2016). Additionally, secondary data collection such as archival records, participant observations, and other news articles is also used to triangulate further and maintain external perspectives (Eisenhardt, 1989) (see Table 1).

Table 1: Overview of sampled firms and data collection

Firm	A	B	C	D
General Information				
Industry	Smart furniture manufacturing industry	Manufacturing industry	Automotive electronics manufacturing industry	Chemical manufacturing industry
Employees	157	67	481	466
Internationalization				
Time before internationalization	From foundation	From foundation	From foundation	3 years
International revenue ratio	85%	98%	68%	43%
International markets	United States, United Kingdom, Australia, Russia, etc.	United States, Europe, Japan, Southeast Asia, etc.	United States, Canada, the United Kingdom, Belgium, Australia and Russia, etc.	Europe, America, Singapore, India, etc.
Open innovation ecosystem				
Activities	Innovation Partnerships and Collaborations	External Technology Acquisition.	Innovation Partnerships and Collaborations	Product and Market Collaboration.
Interviewee	General Manager, Innovation Strategy Director, Global Marketing Director	Co-founder, Director of Technology Innovation, Director of Sales	General Manager, Product Development Manager, Global Brand Manager	CEO, Technology Director, International Marketing Director
Interview duration	2hrs + 1.8hrs+ 1.5hrs	2hrs + 1.5hrs+ 2hrs	1.5hrs + 2hrs+ 1.5hrs	2hrs + 1.5hrs+ 1.5hrs
Secondary data sources	Company internal reports, Annual financial reports, Website announcements	Website press releases, Product information brochures	Company internal records, Website announcements	Company internal records, Product information booklets

Source: Author's own work

3.2 Data Analysis

In the data analysis process, this study combines multiple case study approaches (Eisenhardt, 1989) with thematic analysis (Braun & Clarke, 2008). The thematic analysis aims to form core themes and identify patterns within the data through a coding process, which includes initial coding, clustering, and theme development (Braun & Clarke, 2008). This process provides foundational support for multiple case studies (Eisenhardt, 1989). This study uses ATLAS.ti (Version 9) software to support the encoding of transcripts and thematic analysis, exploring and refining possible themes that may arise in the process of BGs' internationalization from the OIE perspective. Firstly, within-case analysis is conducted, where data from each case is coded to identify sub-themes and core themes, analyzing the uniqueness of each case and extracting key themes and patterns. Secondly, cross-case analysis is employed to compare multiple cases, identifying commonalities and differences, which form the foundation for the finding construct (Miles & Huberman, 1994). To ensure high reliability in the coding process, two experts independently coded the data and identified themes, with an agreement consistency requirement of 95% or higher. If discrepancies arose, the experts engaged in discussions to reach a consensus, ensuring the accuracy and consistency of the data analysis.

FINDINGS

4.1 Within-case Analysis

4.1.1 Firm A

Firm A was founded in 2008. Since its establishment, it has focused on international business and this has always accounted for most of the company's total business. Firm A's international market currently covers more than 30 countries worldwide, including important markets such as the United States, the United Kingdom, Australia, and Russia. Firm A's OIE actors include customers, suppliers, universities, R&D institutions, competitor companies, distributors, design companies and subsidiaries. This diversified actor structure provides strong resource support for Firm A's internationalization process, promotes the company's product innovation, and forms a competitive advantage in the international market, with low prices, fast delivery, and customization.

Based on the resource support from OIE, Firm A can deeply understand market demand, and obtain customer-oriented innovative ideas and R&D creativity, thereby clarifying the direction of product development and expanding its international scope through extension of its customer network. Suppliers provide Firm A with high-quality raw materials and contribute innovative components and application development capabilities in the new product development process, promoting the firm's continuous innovation in the international market. In terms of product technology innovation, cooperation with universities and research institutions enables Firm A to obtain advanced R&D equipment, technical support, and basic R&D results, which reduce R&D costs and accelerate technology transformation. In addition, Firm A obtains technological copyrights and design patents through cooperation with competitor firms and design firms, effectively making up for its lack of R&D. In terms of innovation commercialization, Firm A's close cooperation with dealers and the localized operations of subsidiaries ensure that the firm can quickly respond to changes in the global market, achieve efficient market penetration and enhance brand awareness.

4.1.2 Firm B

Founded in 1962, Firm B has always focused on the international market since its inception, with international business accounting for more than 98% of total revenue currently. Currently, the United States is Firm B's largest international market, accounting for 70% of international sales, and other markets include Europe, Japan, Southeast Asia, etc. Firm B's OIE actors include customers, suppliers, foreign partner firms, and design companies. The OIE helps Firm B gain a deeper understanding of market demands and promote customer-oriented product innovation by providing resource support, innovative components, technical cooperation, and global customer networks. Furthermore, the OIE's support has enhanced Firm B's capabilities in product innovation development and commercialization, accelerated its internationalization process, and promoted its international expansion.

With the resource support provided by the OIE, Firm B can understand market demand and obtain customers' innovative ideas and R&D creativity, providing key support for international entry. Relying on the trust in the relationship with customers, Firm B can quickly capture market changes and respond flexibly. Suppliers provide innovative components to make up for the company's lack of innovative resources. For

example, PU material suppliers and mould factories provide Firm B with the necessary raw materials and production tools to ensure high standards of product quality. In addition, Firm B has obtained advanced cross-domain technology and equipment support through cooperation with foreign partner firms, especially in the field of PU product production. For example, through cooperation with Taiwanese suppliers, Firm B has successfully transformed itself into a major manufacturer of PU products and enhanced its international market competitiveness by mastering core product R&D technology. Moreover, Firm B cooperates with design companies to obtain external professional design support and improve product quality by continuously optimizing production processes. For example, through long-term cooperation with world-renowned brands, Firm B has stabilized its market share and secured a steady flow of orders, thereby enhancing the extent of its internationalization.

4.1.3 Firm C

Founded in 2004, Firm C initially focused on exports. Since 2017, the company has been involved in business in the domestic market, with overseas revenue accounting for 68% currently. About 70% of its products are sold in North America, China, and Europe, with customers in more than 20 countries, such as the United States, Canada, the United Kingdom, Belgium, Australia, and Russia. Firm C's OIE actors include customers, suppliers, governments, and vehicle manufacturers. Firm C possesses key R&D capabilities and makes use of rich and efficient domestic resources and supplier networks to effectively meet the customized needs of international customers. Relying on the OIE platform, it precisely integrates resources from both demand-side and production-side, achieves customer needs analysis, mould design, and contract manufacturing, thus creating a competitive advantage in the international market.

Based on the OIE platform, Firm C gains valuable market demand information and establishment funds from customers, which guides its product development and brings international entry opportunities. Customers' networks help Firm C identify emerging markets and international expansion opportunities. Through OIE, Firm C integrates production capabilities and cooperative R&D support from numerous domestic suppliers, which are crucial for developing new products. This support helps Firm C meet the customized demands of international clients and maintain its competitive edge. Vehicle manufacturers provide valuable market demand information, which helps Firm C tailor its products to align with global automotive industry trends. This collaboration ensures that Firm C stays responsive to market shifts and customer needs across various regions. Additionally, the government provides financial and policy backing, including tax rebates, government subsidies, policy assistance, and government funds, playing a pivotal role in reducing costs and creating a favourable environment for Firm C's growth.

4.1.4 Firm D

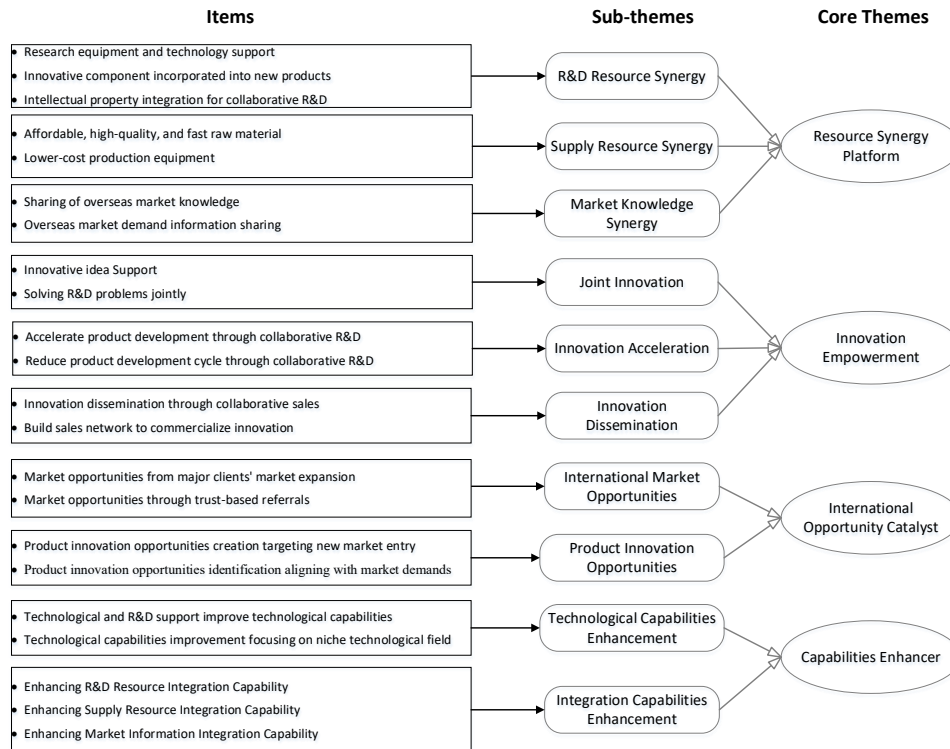
Firm D was founded in 2008 and started exporting in 2011. Currently, overseas revenue accounts for 43%, and major overseas markets include Europe, the United States, Singapore, India and other countries. Firm D's OIE actors include customers, universities and research institutions, banks and insurance companies, and industrial parks. Firm D's OIE contributes to Firm D's exploration of international opportunities and resolution of R&D issues. Based on the support of the OIE, Firm D can integrate innovative resources from the ecosystem actors and the most advanced indirect production technologies to provide customers with highly active, low-cost zinc oxide. High-purity and customized Firm D zinc oxide puts Firm D in a leading position in technology, performance, and cost-effectiveness in the zinc oxide industry.

Supported by the OIE, Firm D gains valuable access to international entry opportunities, foreign market information, and insights into international expansion prospects through collaboration with customers, which directly informs product development and ensures alignment with global market trends. Customers also provide crucial links to foreign governments, assisting Firm D in navigating international regulations and policies, thereby reducing the risk of international entry. Universities and research institutions offer R&D support, providing Firm D with access to basic R&D technology, advanced R&D equipment, and technological solutions. In addition, industrial parks contribute valuable support by facilitating trade negotiations and aligning the business needs of enterprises across different countries. Moreover, Firm D benefits from its partnerships with banks and insurance companies, which offer critical financial support such as bank loans, credit investigation services, and endorsements. These resources facilitate overseas transactions and mitigate the risks of international expansion.

4.2 Cross-case Analysis

Following the thematic analysis method and within-case analysis result, cross-case analysis is performed to extract common themes across the cases and try to conclude the findings on the role of OIE in the internationalization of BGs, with the findings presented in Figure 1.

Figure 1: Data structure



4.2.1 Resource Synergy Platform

R&D Resource Synergy. OIE, as a platform, plays a pivotal role in enabling firms to integrate R&D resources from ecosystem actors, addressing gaps in innovation resources through technical and knowledge support from universities, research institutions, suppliers, and competitors. Firms A, B, and C all emphasized their OIE's critical function in integrating supplier R&D resources. Firm A highlighted the fact that the OIE allows it to integrate R&D capabilities from suppliers, enabling the rapid development of customized products that meet customer demands, thus creating an internationally competitive advantage based on low cost, fast delivery, and customization. The general manager of Firm A stated:

"We primarily provide customized products for overseas customers. When we encounter parts that we cannot produce independently during new product development, we typically collaborate with suppliers. For example, when we lack suitable components for specialized chairs or stools, or cannot manufacture them to customer specifications, we use the platform to find suitable suppliers and co-develop products leveraging their innovative capabilities."

Firms A and D also emphasized OIE's role in integrating supply resources from universities and research institutions. At Firm A, particularly during the mould testing phase of product development, the firm collaborates with local universities and utilizes 3D printing technology to create and test moulds, thereby reducing R&D costs and improving product development efficiency. Similarly, Firm D relies on university research technology to address technical challenges in developing new zinc oxide products. The CEO of firm D explained:

"We collaborate with research institutes and universities based on specific project requirements, typically for a particular phase of the R&D process. For instance, universities or research institutes may provide the necessary technology and equipment, or achieve technical objectives based on our specifications. For example, in terms of the requirement of controlling metal content in processes, they integrate their technology into our process standards to jointly advance the R&D."

Supply Resource Synergy. Firms A, C, and D all highlighted the role of the OIE platform in efficiently integrating supplier resources, particularly in securing cost-effective, high-quality, and rapid supply channels for raw materials and production equipment. Both Firm A and Firm C leverage the OIE platform's supply chain network to integrate domestic supplier resources, ensuring efficient raw material procurement. In China, the availability of low-cost production equipment provides significant competitive advantages for Firms A and C, enabling them to meet production demands at lower costs while maintaining product quality. The general manager of Firm C noted:

"Our ability to integrate resources is a key competitive advantage. With the OIE platform, we're able to easily coordinate with suppliers, creating a flexible supply model that handles a variety of products, small batches, and high-demand needs."

Market Knowledge Synergy, both Firm B and Firm D emphasized the pivotal role of the OIE platform in facilitating the exchange of overseas market knowledge. Through the platform, firms can effectively integrate diverse market information, including political factors, geographical conditions, local transportation, tax policies, and critical insights such as raw material supply. This knowledge sharing not only helps firms navigate the complexities of international markets and mitigate entry risks but also supports informed market decision-making. Regarding the integration of overseas market demand information, Firms A, B, C, and D all highlighted OIE's role in aggregating customer demand data. The general manager of Firm C noted:

"The firm actively integrates both domestic and international customer resources, consolidating demand for multiple varieties and small batches, which enhances procurement scale and reduces costs. With the OIE platform, we can integrate market demand information, enabling our design and development team to implement targeted innovations that drive international expansion."

4.2.2 Innovation Empowerment

Joint Innovation. This study demonstrates that OIE fosters joint innovation by providing support not only during the idea-generation phase but also throughout the problem-solving phase. Firms A, B, C, and D all emphasized the role of the OIE platform in the innovation idea generation phase. OIE help firms facilitate access to creative ideas, particularly from customers and dealers. Firms A and B highlighted the significant role of dealers in sourcing innovation. As intermediaries between the firm and the market, dealers possess a deep understanding of local market needs and consumer preferences. OIE fosters close collaboration between BGs and distributors, enabling the firm to obtain valuable product ideas and market feedback. More notably, all four firms emphasized the importance of customer-driven creative support. For instance, Firm A leveraged the OIE platform to gain creative input from customers, with customer foresight offering new market directions and insights for product innovation. Such customer-generated ideas typically hold high market value because customers, being in direct contact with the market, users, and designers, are better positioned to anticipate market trends and demands. The innovation strategy director of Firm A noted:

"The OIE platform provides us with a crucial source of creative ideas. Our international customers span a broad range of product sectors and often access market information earlier than us because they are directly in touch with the market, users, and designers. Their vision and thinking tend to be more forward-looking, and their requests signal market demand, which we use to guide our expansion strategy."

In the problem-solving phase of innovation, firms A, B, C, and D all highlighted the function of the OIE platform in providing diverse and comprehensive solutions. The platform facilitates the sharing of intellectual property, R&D capabilities, technical equipment, basic research results, and product material information. Firstly, the OIE platform enables Firms A and B to access intellectual property support from partners, allowing them to overcome technical bottlenecks by leveraging complementary existing technologies. Secondly, the OIE platform consolidates supplier resources, with Firms A, B, and C particularly emphasizing the critical R&D capabilities provided by suppliers. Suppliers, especially in the design and production of specialized components, compensate for gaps in BGs' R&D resources, offering essential technical support to facilitate product development. Additionally, Firms A and D noted their collaboration with R&D institutions through the OIE platform, enabling them to integrate institutional technical support, particularly in the early innovation stages, thus accelerating product development. Finally, the OIE platform

serves as a valuable source of raw material supply information for all four firms. As the innovation strategy director of firm A explained:

"When facing R&D challenges, the OIE platform offers us a multi-source problem-solving channel. For example, when developing new products, if we lack the required product module, we will turn to customers for supply channel information. When encountering specialized parts that we cannot produce, we collaborate with suppliers to co-develop solutions. Moreover, to address gaps in our innovation capabilities, we also partner with leading international design companies, purchasing their designs or patents to jointly create a market advantage with advanced technology and lower costs."

Innovation Acceleration. Firms A, B, C, and D all emphasized the role of the OIE platform in accelerating product development, reducing development cycles, and facilitating access to R&D material supply information. The platform enhances R&D speed through comprehensive resource integration and collaboration. Firstly, the OIE platform significantly accelerates product development by fostering cooperation among member companies. When firms encounter technical bottlenecks or require specialized support, the R&D process is expedited through access to advanced equipment and technology from other ecosystem actors. As the director of technology innovation of firm B stated:

"The platform provides us with resource support from various channels. With advanced equipment, technology, and cooperative models, it not only accelerates R&D but also reduces costs."

Secondly, the OIE platform reduces R&D cycles by enabling firms to collaborate with other members. By sharing R&D resources, technological advancements, and market demand information, firms can complete product development more quickly. The platform's cooperation mechanisms allow firms to efficiently integrate resources from multiple parties, thus shortening R&D timelines and enhancing market responsiveness.

Innovation Dissemination. OIE platforms effectively facilitate international expansion by enabling BGs' innovation dissemination. This study shows that OIE promotes innovation dissemination through collaborative sales and sales networks. First, OIE promotes the implementation of collaborative sales. Firms A, B, and C collaborate with ecosystem partners, each assuming distinct roles in product development and innovation diffusion. This allows firms to focus on strengthening their core competencies while leveraging their partners' advantages to rapidly expand into international markets. Second, Firms A, B, C, and D show that OIE helps BGs to gather and integrate global market demand information by consolidating sales network resources. Firm B, for example, utilizes collaborative sales channels, such as dealer networks and vehicle manufacturers, to collect market information from various regions and industries. As the sales director of firm B explained:

"With the OIE platform, we've built a global sales network that helps us work closely with partners to spread innovation faster. This approach strengthens the whole ecosystem and makes it easier to get innovative solutions into the market."

4.2.3 International Opportunities Catalyst

Product Innovation Opportunities. The OIE provides firms with valuable product innovation opportunities that are essential for their internationalization into new global markets. By fostering collaboration with ecosystem actors, OIE facilitates the identification and creation of product innovation opportunities that align with market demands. Utilizing an OIE to engage with key partners such as customers, suppliers, research institutions, and industry experts, enables them to develop innovative products tailored to new markets. This process not only enhances competitiveness in existing markets but also opens doors for BGs to expand into previously untapped sectors. For example, Firms A, B, C, and D leverage OIE to acquire product innovation opportunities, launching offerings that cater to the demands of new markets. Product innovation not only boosts competitiveness in existing markets but also establishes a solid foundation for expansion into new markets. As the general manager of firm A highlighted:

"With its strong integration of market information through OIE, the company can accurately and timely understand product demand. This insight provides us with valuable product innovation opportunities, such as collaborating with vehicle manufacturers to gain first-hand knowledge of the consumption and demand for automotive aftermarket parts."

International Market Opportunities. The international market expansion of major customers provides firms with significant opportunities for international market entry. Through the OIE platform, Firms A, B, C, and D are able to rapidly penetrate international markets by following their major customers through deep trust cooperation. This collaboration not only facilitates BGs' entry into new markets but also strengthens long-term relationships with key customers. As the CEO of firm D explained:

"In the early stages, our reliance on major customers reached 70 to 80 percent, and our international expansion opportunities were primarily driven by one major customer. Particularly in the early days, major customers frequently provided us with new market opportunities: they consistently raised new product requirements and asked if we could meet their needs. Due to the large scale of major customers, their demands have brought us abundant market opportunities."

4.2.4 Capabilities Enhancer

Integration capabilities Enhancement. This study demonstrates that OIE plays a crucial role in enhancing firms' integration capabilities, enabling them to integrate both R&D resources and supply chain resources across various ecosystem actors, including universities, research institutions, suppliers, and competitors. For example, Firm D illustrates how the OIE supports the integration of university research and technical resources. During the development of new zinc oxide products, Firm D leveraged the OIE to integrate research technology from universities, addressing technical challenges and accelerating innovation. For both Firm A and Firm B, the OIE enhances their integration capabilities by facilitating the integration of supplier R&D resources. By leveraging OIE, these firms integrate R&D capabilities from suppliers, ensuring low-cost production, fast delivery, and customization. This collaboration allows them to rapidly develop customized products that meet customer demands, thereby creating a competitive advantage in the international market. Firm B's integration of external technological expertise through its OIE enables quicker responses to market demands and fosters the development of differentiated products, thus enhancing its competitive positioning.- As the general manager of firm A noted:

"Resource integration is a key advantage for us. Thanks to the OIE platform, we can quickly integrate supplier resources and R&D resources, which helps us stay flexible and responsive, giving us an edge with a wide range of products, small batches, fast delivery, and customized solutions."

Technological Capabilities Enhancement. OIE plays a critical role in enhancing the technological capabilities of BGs. In this study, the support provided by the OIE platform enables BGs to focus on advancing their technological capabilities within specific niche areas. Through collaboration with other ecosystem actors, firms can access vital technical support and R&D resources, allowing them to concentrate on overcoming technical bottlenecks and strengthening their expertise in specialized fields. The improvement in technological capabilities further allows these firms to maintain flexibility in the face of shifting international market demands, thereby enhancing their responsiveness to the dynamic requirements of international markets and sustaining their global competitiveness.

Additionally, the OIE promotes the sharing and integration of resources, facilitating significant advancements in technological capabilities and product diversification. Through interactions with various ecosystem actors, such as suppliers, customers, universities, and research institutions, firms gain access to external technological expertise and integrate these technologies with internal R&D processes, thereby improving both their technological capacity and innovation efficiency. For example, Firm D, leveraging the OIE platform, successfully developed multiple new products based on its core zinc oxide technology, enabling it to enter diverse industries such as rubber tyres, electronics, and cosmetics. Therefore, the enhancement of technological capabilities not only broadened Firm D's product portfolio but also strengthened its competitive position in international markets. As the international marketing director of firm D noted:

"With support from other ecosystem actors, we can focus on enhancing our indirect zinc oxide production technology. For example, we developed a new granular product focused on zinc oxide tech. By boosting the activity of the zinc oxide, this product helps our clients increase their output from 5% to 25%. The support from the OIE also allows us to create multiple products for different industries, helping our firm expand into multiple sectors and driving our international growth."

5. DISCUSSION

The findings of this study show that OIE plays the roles of resource synergy platform, innovation empowerment, international opportunities catalyst, and capabilities enhancer in the internationalization of BGs. As a resource synergy platform, an OIE enables BGs to access resources from ecosystem actors such as academic institutions, suppliers, and customers. Through collaboration with these actors, BGs obtain specific types of resource support, including R&D resources, supply resources, and market knowledge. These findings align with Gimenez-Fernandez et al. (2022), who emphasized the point that an OIE serves as an

innovation community comprising actors with heterogeneous resource bases. Ecosystem actors acquire resources through collaboration with others in the ecosystem (Hilmersson et al., 2023; Johanson & Vahlne, 2009). However, in the context of BGs, ecosystem collaboration within OIE places greater emphasis on domestic suppliers, who not only provide critical components, production capacity, and technologies (Xie & Wang, 2020; Zhao & Yi, 2023), but also contribute crucial applied R&D capabilities. The support of applied R&D capabilities from suppliers enables BGs to concentrate on their core R&D strengths while leveraging complementary technologies and capacities from suppliers, converting R&D outputs into practical products.

In this study, OIE also functions as an innovation empowerment, contributing to joint innovation, innovation acceleration, and innovation dissemination of BGs. Specifically, the findings of Liu et al. (2022) and Xie and Wang (2020) are confirmed in the BGs context, demonstrating that an OIE can accelerate innovation and facilitate its dissemination, thereby expediting the product innovation process of BGs. In contrast, the joint innovation achieved through OIE complements existing knowledge on how BGs achieve early internationalization through innovation. In contrast to existing findings, such as lean startup innovation (Zijdemans & Tanev, 2014) and business model innovation (Kraus et al., 2017), OIE provide a resource platform for BGs to integrate innovative resources from ecosystem actors, addressing the resource constraints that BGs typically face in pursuing early internationalization through innovation.

The support of the OIE is not only reflected in innovation co-creation but also in international opportunities catalyst and capabilities enhancement. In this study, BGs access international markets either through collaboration with OIE actors or by leveraging innovative products. Consistent with Xie and Wang (2020), OIE offer early internationalization opportunities, capital, and network connections, while trust-based referrals from existing customers help identify new markets. This study extends existing research by applying prior findings to the BGs context, demonstrating that OIE facilitates both product development and commercialization, thereby enabling market entry through demand creation and broader market access.

The findings show that OIE plays a capabilities enhancer role, helping BGs enhance the integration capabilities and technological capabilities. Prior research has shown that while technological capabilities enable BGs to enter multiple markets simultaneously, these firms often lack the necessary capabilities to manage the entire innovation process (Li et al., 2012; Chabbouh & Boujelbene, 2020). This study addresses this gap by demonstrating that OIE facilitates the development of technological capabilities, thereby helping BGs overcome innovation-related capability deficiencies. Moreover, a novel contribution of this study is the finding that OIE enhances BGs' integration capabilities, enabling them to mitigate resource constraints in the internationalization process through innovation in a more cost-effective manner.

6. CONCLUSIONS

Previous literature has demonstrated the positive role of OIE in SMEs' innovation, while the findings of this study extend previous research on the role of OIE to the domain of the internationalization of BGs (Lekovic et al., 2020; Fallah, 2022). This positively responds to the concern that both innovation and internationalization require resources, while resource-constrained global startups cannot simultaneously deal with innovation and early internationalization (Moogk, 2012). Grounded in Resource-based Theory and drawn from the innovation approach to internationalization, this study finds that OIE plays the roles of resource synergy platform, innovation empowerment, international opportunities catalyst, and capabilities enhancer in the internationalization of BGs.

6.1 Theoretical implications

This study offers significant contributions to several streams of literature, including open innovation ecosystems, international entrepreneurship, and Resource-based Theory. The findings advance understanding in these areas by offering new insights into the role of OIE in the internationalisation of BGs. Specifically:

Contribution to open innovation ecosystem literature: Prior research has primarily focused on OIE as sources of resource support, such as R&D resources (Gimenez-Fernandez et al., 2022), supply resources (Xie & Wang, 2020; Zhao & Yi, 2023), and knowledge (Rohrbeck et al., 2009; Zhao & Yi, 2023). While this study confirms the role of OIE in facilitating resource synergy, it extends existing knowledge by situating it in the context of BGs' internationalization, with particular emphasis on the resource support from domestic suppliers and international opportunities. Suppliers provide critical applied R&D capabilities, allowing BGs to focus on their core innovation strengths while leveraging complementary technologies and capacities from external actors. The findings suggest that OIE offer vital applied innovation resources that help compensate for the innovation resource shortcomings typically faced by BGs during early internationalization. These

international opportunities provided by OIE accelerate the internationalization process of BGs and facilitate their global expansion. These findings extend the OIE knowledge into the international area, and respond to scholars' call for an in-depth and holistic innovation ecosystem perspective on the field of international entrepreneurship (Zahoor et al., 2020; Zahra & Nambisan, 2012).

Contribution to international entrepreneurship research: Previous studies on BGs' innovation strategies for early internationalization identified lean startup innovation (Zijdemans & Tanev, 2014) and business model innovation (Kraus et al., 2017). However, these approaches have failed to effectively address the resource constraints faced by BGs in achieving early internationalization through innovation. Adopting an OIE perspective, this study explores an open innovation approach that enables BGs to innovate in a cost-effective, flexible, and externally reliant manner. Therefore, this study provides an innovation approach to complement existing knowledge on how BGs achieve early internationalization through innovation. Specifically, OIE provides a way to reconcile the contradiction between innovation and early internationalization (Kraus et al., 2017; Moogk, 2012; Tanev et al., 2015), allowing BGs to integrate external resources through the OIE platform to alleviate the resource constraints.

Contribution to Resource-based Theory: The study found that OIE improved BGs' resource integration capability to integrate external resources and thus solved the problem of resource deficiency in early internationalization. This finding complements the extended Resource-based Theory (Dyer & Singh, 1998; Lavie, 2006) by revealing the dynamism of external resources and enhancing BGs' integration capability. Firstly, OIE provides an innovation community or network of actors endowed with heterogeneous knowledge and resource bases (Gimenez-Fernandez et al., 2022). OIE is conducive to BGs integrating resources, making up for shortcomings, and joint innovation can thus be achieved through collaboration within the OIE. Secondly, this study underscores the dynamic nature of resource coordination as BGs acquire resources from OIE. The rapidly evolving global market compels BGs to continually reconfigure resources to capture emerging opportunities. Meanwhile, the inherent dynamism of OIE transforms resources from static assets into fluid, reconfigurable elements, further amplifying resource dynamism within the ecosystem.

6.2 Practical implications

This study provides actionable insights for managers in the internationalization and innovation departments of BGs. This study offers internationalization managers valuable insights and alternative approaches supported by OIE for formulating international market entry and expansion strategies. Firstly, internationalization managers can leverage OIE to access international market knowledge and entry opportunities. This helps decision-makers identify target markets, navigate cross-border complexities, and mitigate entry risks. For example, Firm C benefited from market demand information obtained through an OIE to align its products with global automotive industry trends, enabling high responsiveness to market changes and customer needs while reducing market entry risks. Secondly, the integration of innovation resources, access to product innovation opportunities, and market knowledge through the OIE supports the development and dissemination of customized innovations, thereby contributing to BGs' international growth. For instance, Firm A utilized R&D capabilities from ecosystem actors to rapidly develop tailored products, gaining a competitive advantage in international markets through low cost, fast delivery, and high customization. Moreover, product innovations supported by OIE facilitate entry into new markets by generating demand and expanding market reach.

This study offers innovation managers valuable insights into how OIE can support BGs in overcoming challenges throughout the innovation process. Firstly, OIE provides critical innovation ideas derived from product innovation opportunities and market knowledge. For example, Firm A leverages market insights from the OIE to gain a deep understanding of customer demand, generating user-oriented innovation ideas and R&D creativity, which helps clarify product development directions. Secondly, OIE offers complementary innovation resources to address challenges during the problem-solving phase, such as applied innovation capabilities and R&D outcomes. For instance, Firms A and B access intellectual property support from academic partners, which helps them overcome technical bottlenecks. In return, these firms assist academic institutions in transforming their research outcomes into practical products. Finally, OIE facilitates innovation dissemination through collaborative sales models and the establishment of sales networks. For example, Firm B utilizes joint sales channels to gather market information across different regions and industries, supporting the scaling up and diffusion of innovative products.

In addition, the conclusions of this study can also provide a reference for policy formulation of public institutions. For example, the management agency of the international innovation park can support ecosystem

actors in carrying out international activities by formulating innovation incentives, such as links with overseas resources, innovation resource sharing, innovation activity collaboration, resource support, etc.

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APPENDIX1

Interview Protocol

A. Internationalization of firms
Could you introduce your firm? Could you describe the internationalization process of your firm (When, Where, How)?
B. Open innovation ecosystem of firms
Who are the actors of the open innovation ecosystem that your firm participates in? What resources can your firm get from the open innovation ecosystem? Can you describe open innovation ecosystem activities your firm has participated in (When, Where, How)?
C. Role of OIE in the Internationalization of firms
What is the role of the open innovation ecosystem in the product innovation of your firm? What is the role of the open innovation ecosystem in the internationalization of your firm?
D. Firm Profile
Year of Founding / international debut: International Business Income Percentage: Number of employees at founding / current: Industry: Main activities: Foreign Market access Countries: Mode of entry:
E. Participant Profile
Name: Age (range): Gender: Position: Length of working experience: