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Institutional adversity, external knowledge sources, and new ventures' innovation: An institutional polycentrism theory perspective

Introduction

In turbulent environments, firms must combine and recombine existing knowledge with external knowledge that adds value if they are to maintain their competitive advantage and their internal innovation activities (Criscuolo, Laursen, Reichstein, & Salter, 2018; Laursen & Salter, 2006; Leiponen & Helfat, 2010; Rosenkopf & Nerkar, 2001; Love, Roper, & Vahter, 2014; Van de Vrande, 2013). The framework that underlies this study is built on the literature on external knowledge-sourcing, that is, firms' ability to "tap into new ideas and technologies from beyond their boundaries" (Monteiro & Birkinshaw, 2017, p. 342). Organizations identify new solutions by creating and recombining knowledge across their boundaries (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001). External knowledge sources through collaborations have become essential for new ventures, as they frequently cannot handle the costs of research and development (R&D). New ventures face more challenges in decision-making than large, established firms, with their skilled managers, teams of experts, and significant investments in innovation, do (Katila, 2002; Katila & Ahuja, 2002), so new ventures depend heavily on external knowledge and advice as critical resources for innovation and long-term survival (Chrisman, McMullan, & Hall 2005; Davidsson & Honig, 2003; Hoang & Antoncic, 2003).

Research has explained that external knowledge sources are primary resources that support innovation and favourable entrepreneurial outcomes (Escribano, Fosfuri, & Trib´o, 2009; Faems, De Visser, Andries, & Van Looy 2010; Kuhn & Galloway, 2015; Laursen & Salter, 2006; Van de Vrande, 2013; Vissa & Chacar, 2009). However, there is limited research on the context under which external knowledge sources improve new ventures' innovation performance (Asimakopoulos, Revilla, & Slavova 2020; Chatterji, Delecourt, Hasan, &

Koning, 2019; Hung & Chou, 2013; Leiponen & Helfat, 2010; Lerner & Malmendier, 2013), and scholars have noted mixed evidence on the types of external knowledge that are associated with firms' innovativeness (Álvarez, Marin, & Fonfría, 2009; Arora, Di Giovanni, & Lechevallier, 2001; Fritsch & Lukas, 2001; Lhuillery & Pfister, 2009; Nieto & Santamaría, 2007; Schøtt & Jensen, 2016; Tether, 2002; Veugelers, 1997). To fill this gap in the literature, the first objective of this study is to extend previous research by analysing the effect of external knowledge sources (i.e., networks, professional, international, market-based, and work-based) on new ventures' innovation performance. We explore how differences in new ventures' search strategies influence their ability to innovate and latter build on the argument that different types of external knowledge provide different benefits.

The findings and assumptions that have informed theory on this subject have assumed that the relationship between external knowledge sources is homogenous across institutional contexts (Gassmann, Enkel, & Chesbrough, 2010; Escribano, Fosfuri, & Trib´o, 2009). Contingency studies of large firms on this topic have focused primarily on the moderating impacts of firm characteristics (Berchicci, 2013; Escribano, Fosfuriand, & Trib´o, 2009; Garcia, Zouaghi, & Garcia, 2019; Grigoriou & Rothaerm 2017) and industry types (Rowley, Behrens, & Krackhardt, 2000), but little or no empirical research has looked at the moderating impact of country-level factors surrounding external knowledge sources and their impact on new ventures' innovation. Countries are characterized by the maturity of their institutions, the degree to which their innovation systems are well-established, their universities, and the strength of their R&D capabilities. We examine how adversity that arises from formal institutions affects the relationship between external knowledge-sourcing and new ventures' innovation. To capture the strength of such institutional adversity, we employ the theory of institutional polycentrism, which suggests that institutions originate from multiple rule-setting centres like governments, associations, and communities (Ostrom, 2010). We argue that

country-level institutional adversity leads entrepreneurs to spend time and resources dealing with it, reducing the likelihood of entrepreneurial success and increasing opportunity costs (Batjargal, Hitt, Tsui, Arregle, Webb, & Miller 2013). A new venture is especially vulnerable to weak institutions, as much-needed capital is difficult to access during times of institutional adversity. In such situations, entrepreneurs must extend substitutional effort to minimize negative spill-overs. Therefore, the second objective of this study is to define the contextual embeddedness of the relationship between external knowledge-sourcing and new ventures' innovation so as to clarify the relationship between the level of external knowledge-sourcing and new ventures' innovation and how entrepreneurs who face both the liability of newness and institutional adversity survive in this context?

Building on institutional polycentrism theory and knowledge-based theory, this study offers four main contributions to current research in entrepreneurship. *First*, it responds to research calls to develop a more nuanced explanation of the interaction between the institutional context and the knowledge-based view (KBV) (De Clercq & Arenius, 2006; Phelps, Heidl, & Wadhwa, 2012). In doing so, we contribute to the innovation management literature on firms' innovative performance by investigating the under-researched role of external knowledge sources as an integral component of new ventures' innovation (Berchicci, 2013; Escribano, Fosfuriand, & Trib´o, 2009; Garcia, Zouaghi, & Garcia, 2019; Hung & Chou, 2013; Laursen & Salter, 2006; Love, Roper, & Vahter, 2014). *Second*, although research in entrepreneurship context has used the theoretical foundations of institutional theory as a resource (North, 2005), it has not attempted to integrate entrepreneurship with the theoretical perspectives of the many kinds of adversity in institutions to generate balanced theoretical foundations. We contribute to calls for integrative theory development by integrating the institutional polycentrism theory with the literature on external knowledge-sourcing (Jones, Coviello, & Tang, 2011; Keupp & Gassmann, 2009). *Third*, the framework that underlies this

study explains how new ventures that operate in resource-constrained contexts (high adversity) may face unique challenges and how capitalizing on external knowledge-sourcing can help them perform and bring their innovations to market. In doing so, the study contributes to knowledge on how the contingent value of resources functions as a boundary condition (Brass, Galaskiewicz, Greve, & Tsai, 2004; Burt, 1992).

Finally, by explicating the intricate interplay between external knowledge-sourcing and the institutional context in which such activities take place, we respond to calls to embed external knowledge-sourcing into context (Gassmann et al., 2010; (Gassmann et al., 2010; Kafouros, Wang, Piperopoulos, & Zhang, 2015). Research has shown that resources like external knowledge-sourcing can help firms identify and exploit new opportunities (Hohenthal, Johanson, & Johanson, 2003; Mueller & Shepherd, 2016; Yamakawa, Khavul, Peng, & Deeds, 2013), but, as far as we are aware, no empirical cross-country work has been done on the interplay among external knowledge-sourcing, adversity that arises from institutions, and new ventures' innovation. Therefore, calls have been made to extend research on the knowledge-based view to include cross-national differences in entrepreneurial behaviour and in individual firms' unique sets of resources (Gassmann et al., 2010; Phelps et al., 2012).

Research framework

The knowledge-based view (Conner & Prahalad, 1996; Grant, 1996; Kogut & Zander, 1992) sees entrepreneurship as a process by which entrepreneurs or entrepreneurial teams identify, acquire, and accumulate resources to pursue opportunities (Ireland, Hitt, Camp, & Sexton, 2001; Jarillo, 1989; Roberts, Stevenson, Sahlman, Marshall, & Hamermesh, 2006). Once new ventures can develop, acquire, and exploit key resources—those that are valuable, rare, inimitable and non-substitutable—they are likely to attain sustainable competitive advantage and enjoy strong performance in the market (Alvarez & Barney, 2007; Barney, 1996, 2001). New ventures do not have the resources large firms have, so they rely more on knowledge-

based resources to gain competitive advantage. Research has documented many reasons for new ventures' failure, and lack of knowledge has emerged as a key barrier (Armanios, Eesley, Li, & Eisenhardt, 2017; Azoulay & Shane, 2001; Kuhn & Galloway, 2015; Kulchina, 2017).

External networks are known for their role in economic growth and disseminating knowledge (Cockburn & Henderson, 1998). Although resources provided through external knowledge-sourcing enables new ventures to build competitive advantage (Barney, 1991), take advantage of new opportunities, and promote growth (Penrose 1959; Barney, 1996), this topic has not received much attention in the entrepreneurship literature, especially in terms of its multilevel context. To fill this gap, the research framework that underlies this study takes into account the roles of *external knowledge-sourcing (the KBV) and adversity from institutions in gaining competitive advantage through innovation*. We conceptualize external knowledge-sourcing as new ventures' use of knowledge in the form of advice from external channels like advising services, customers, suppliers, competitors, and peer entrepreneurs. We seek to clarify the contingencies and contexts in which entrepreneurs engage in innovative activities. Our research framework, presented in Figure 1, links the joint effects of weak and inefficient institutions (institutional adversity) and external knowledge-sourcing on new ventures' innovation.

---Insert Figure 1 about here.---

External knowledge sources and new ventures' innovation

In a resource-constrained context, a new venture's survival depends on effective combination of knowledge gained through various channels (Kuhn & Galloway, 2015). We define those channels as external knowledge sourcing when entrepreneurs use diverse channels such as universities, customers, suppliers and competitors provides firms with access to different types of knowledge along the value chain (e.g. Van Beers and Zand, 2014;

Asimakopoulos et al., 2020 which help them to gain knowledge from different opportunities (Love, Roper and Vahter, 2014).

The KBV provides strong evidence that knowledge gained from business support services has a positive impact on a new venture's performance (e.g., Bennett, 2008; Bennett & Robson, 1999; Chrisman, McMullan, & Hall, 2005; Robson & Bennett, 2000). The KBV considers knowledge a primary resource that can impact the success of a new venture's innovative outcomes and can serve as source of competitive advantage (Alvarez & Busenitz, 2001). While some new ventures rely on their own trial-and-error processes, advice from peers and mentors (Lerner & Malmendier, 2013; Nanda & Sørensen, 2010; Scott & Shu, 2017), and their own experience and knowledge (Sørensen, 2007; Lerner & Malmendier, 2013; Lindquist, Sol, & Van Praag, 2015), others combat their challenges by hiring experienced managers or entering incubator or accelerator programs (Cohen & Hochberg, 2014; Kulchina, 2016). Whatever their strategy, their common objective is to handle their resource-constrained environment by building the knowledge they require to maximize their performance.

The early Schumpeterian model, in which an entrepreneur brings innovations to markets, has been superseded by a rich picture of divers actors working together in iterative trial-and-error processes to bring about the successful commercial exploitation of a new idea (Laursen & Salter, 2006). This new model of innovation through external knowledge-sourcing is interactive in nature and relies heavily on these actors' interaction with lead users, suppliers, and a range of institutions within the innovation system (Brown & Eisenhardt, 1995; Lundvall, 1992; Szulanski, 1996; von Hippel, 1998). The actors capture the external knowledge that allows entrepreneurs' ability to identify market opportunities (Gruber, MacMillan, & Thompson, 2013), suggesting that entrepreneurs must develop business models that allow external sources of knowledge to flow into their new ventures. As an outcome, the level of such diverse external knowledge can affect the speed of internal innovation.

Seeking advice through formal and informal networking facilitates external knowledge creation and is important for established businesses, but it is particularly critical for new ventures, as it can help them access resources quickly (Baum, Calabrese, & Silverman, 2000; Carayannis, Alexander, & Ioannidis, 2000; Teece, 1986). Therefore, we propose the following:

Hypothesis 1a: External knowledge-sourcing is positively associated with new ventures' innovation.

Research has shown that exploration of external knowledge depends on the type of knowledge sources being explored (Cumming & Fischer, 2012; Schott & Sedaghat, 2014). For example, Zeng, Xie, & Tam, (2010) showed that Chinese manufacturing firms' cooperation with suppliers and clients plays a more significant role in innovative performance than cooperation with research institutions, universities, and government agencies does, and in the Spanish context, Alvarez, Marin, & Fonfria (2009) showed that cooperation between competitors has more influence on company performance than cooperation with other partners does (Alvarez, Marin, & Fonfría, 2009). Other studies have claimed either that cooperation with customers, suppliers, and competitors has a positive influence on performance (Arora et al. 2001; Fritsch & Lukas, 2001; Tether, 2002; Veugelers, 1997) or that that cooperation with competitors has a smaller effect on innovation than cooperation with customer, suppliers, and competitors does (Miotti & Sachwald, 2003; Nieto & Santamaría, 2007). These mixed findings regarding types of external knowledge sources suggest that new ventures must not only consider how they may increase costs and decrease returns but also how different types of external knowledge sources lead to different outcomes (Faems, De Visser, Andries, & Van Looy, 2010; Laursen & Salter, 2006) and how to manage inflows of new ideas and intellectual property when they look for variety and diversity in external knowledge acquisition (Bogers, Bekkers, & Granstrand, 2012; Chesbrough, 2003; Gruber et al., 2013).

External knowledge sources enable entrepreneurs to take advantage of the many resources that come with them, such as non-redundant information, knowledge, and referrals; brokerage; access to tangible resources; structural autonomy; social and emotional support; and the transitivity mechanism (Burt, 1992; Granovetter, 1973; 1995; Stam & Elfring, 2008; Stuart & Sorenson, 2007. One reason that external knowledge-sourcing has an important role in shaping the entrepreneurial process is that it provides the channels through which private information flows. For example, an entrepreneur who capitalizes on multiple external knowledge sources can learn about opportunities like new market segments for existing products and/or new product ideas in timely way by bridging the gap between the entrepreneur and potential customers (Stam & Elfring, 2008; Stuart & Sorenson, 2007), thus reducing the risk and uncertainty that is inherent in international operations (Nerkar & Paruchuri, 2005; Selnes & Sallis, 2003).

Therefore, we believe that external knowledge-sourcing through diverse channels, such as professional, international, market-based and workplace actors, provides entrepreneurs with access to diverse types of knowledge along their value chains, benefiting the new ventures' innovation outcomes. Although research has shown that many factors can affect how external knowledge-sourcing fosters successful innovation in new ventures, the specific attributes and relationships are not fully understood. Therefore, we propose the following:

> *Hypothesis 1b: Different types of external knowledge sources (i.e., networks of professional advisor, international advisors, market advisors, and workplace advisors) are positively associated with new ventures' innovation.*

Adversity from institutions and new ventures' innovation: an institutional polycentrism perspective

Institutions have explicit rules that are taken for granted and that provide implicit guidelines for economic actors' behaviour and its outcomes (Holmes, Miller, Hitt, & Salmador, 2013; Powell & DiMaggio, 1991). Sub-national differences, formal and informal, that are nested within the national level are embedded in "the rules of the game" and constraints for behaviour (North, 1990; Scott, 2008; Weber, 1978). Economic institutions include market intermediaries that compile and disseminate market information and build lines of communication between transacting parties, and factor markets that provide firms with the physical and intellectual resources they need, while political institutions comprise the legal and regulatory systems that govern and protect firms' business transactions, and social institutions determine appropriate resource-renewing behaviour (Chan et al., 2010; North, 1990; Scott, 1995).

Corresponding to the concepts of cultural values and practices in cross-cultural research (Javidan, House, Dorfman, Hanges, & Sully de Luque, 2006), research has largely explored either a single institution effect or the separate effects of the three pillar framework (regulatory, cognitive and normative) (Busenitz, Gomez, & Spencer, 2000; Fogel, Hawk, Morck, & Yeung, 2006). The theory of institutional polycentrism postulates that institutions have multiplicative influences, and they affect outcomes in interdependent and composite ways, partly because of their common historical, geographic, and cultural foundations (Acemoglu, Johnson, & Robinson, 2005; Greif & Tabellini, 2010; Hall & Soskice, 2001; Hall & Thelen, 2009; Holmes et al., 2013; Ostrom, 1986, 2005a, 2010; Sobel & Coyne, 2011). Ostrom (1999: 57) referred to this multiplicative effect as "one where many elements are capable of making mutual adjustments for ordering their relationships with one another within a general system of rules where each element acts with independence of other elements." (See also Ostrom (2008) and McGinnis (1999).) Multiplicity, then, refers to the confluence of different types of interrelated institutions, a polycentric system in which multiple public and private organizations at multiple

scales jointly affect collective benefits and costs (Batjargal et al., 2013; Ostrom, 2005a; Tzeng, Beamish, & Chen, 2011). Institutional weakness, a confluence of weak and inefficient economic, political, and social institutions, can create a hostile environment for new ventures (Batjargal et al., 2013). Weak and inefficient institutions can decrease the efficiency of resource allocation by creating an adverse institutional order, leading to adversity from institutions (Taussig & Delios, 2015). In such an environment, identifying opportunities becomes more challenging, transaction costs for arm's-length exchanges increase, and access to resources is constrained (Batjargal et al., 2013).

We define this hostility in the institutional environment as country-level institutional adversity and examine the multiplicative effect of institutional adversity, composed of adversity from political, social, and economic institutions, on new ventures' innovation. Firms' and individuals' ability to engage in market transactions without incurring undue costs or risk depends on the effective functioning of formal institutions (implying low institutional adversity), which facilitates competitive market mechanisms (Meyer, Estrin, Bhaumik, & Peng, 2009; North, 1990). Thus, in environments with high levels of institutional adversity, entrepreneurs spend time and resources dealing with these adversities, especially in the early years of their ventures' development, which reduces their ability to innovate and increases opportunity costs (Batjargal et al., 2013). Therefore, we propose the following:

Hypothesis 2: Institutional adversity is negatively associated with new ventures' innovation.

The moderating role of institutional adversity

As we have explained, research has highlighted the various benefits of a new venture's having an external knowledge-sourcing strategy in gaining access to new or complementary competencies, technologies, and markets. The literature has also highlighted the important role that trust plays in developing and sustaining successful external knowledge-sourcing in terms

of the creation, flow, and integration of knowledge (Bolton, Malmrose, & Ouchi, 1994; Coles, Harris, & Dickson, 2003; Cooke, 1996; Powell et al., 2005). At the institutional level, trust has been considered an important element of the institutional context (De Clercq, Thongpapanl, & Dimov, 2011), suggesting that the institutional context impacts the external knowledge-sourcing mechanism for new ventures' innovation. Because most researchers have generalized the effects of knowledge-based networks (Burt, 2000; Phelps et al., 2012), little is known about the contextual contingencies of entrepreneurs' external knowledge-sourcing and its effects on innovation (Phelps et al., 2012). Some evidence has been presented that external knowledge-sourcing affects entrepreneurial outcomes differently based on the institutional or industry context (Batjargal, 2010; Koka & Prescott, 2008; Schøtt & Jensen, 2016), but such evidence in the new-venture context is largely missing. Calls have been made for examinations of the institutional/contextual condition that leads to variation in external knowledge.

Research has suggested that institutional adversity creates a hostile environment for entrepreneurs and their new ventures and makes opportunity identification more challenging (Batjargal et al., 2013; Tzeng et al., 2011). Along the same lines, we suggest that institutional adversity affects the relationship between the external knowledge-sourcing and new ventures' innovation. We propose that, in institutional environments that are characterised by a high level of adversity, the more external knowledge-sourcing is used, the better new ventures' innovation performance will be because of the ventures' access to diverse valuable resources.

Another way in which institutions may moderate the relationship between external knowledge-sourcing and new ventures innovation is by providing a substitution effect (Batjargal et al., 2013) and a support effect through access to valuable resources (Ács, Autio, & Szerb, 2014). For example, some governments have sponsored access to knowledge through counselling services or networking channels (e.g., Bennett, Robson, & Bratton, 2001; Chrisman et al., 2005). As resources, networks can help to compensate for the inefficient rules

in countries with high levels of institutional adversity (Batjargal et al., 2013). Therefore, we propose the following hypothesis:

> *Hypothesis 3: Institutional adversity positively moderates the effect of external knowledge-sourcing on new ventures' innovation such that the relationship is stronger when the level of institutional adversity is high.*

Methodology

To determine individual behaviour as it relates to external knowledge-sourcing and new ventures' innovation, we obtained individual-level observations from the Global Entrepreneurship Monitor's (GEM: Bosma, 2013; Schøtt & Jensen, 2016) Adult Population Survey (APS). From 2009 to 2013, GEM measured the questions in the APS regarding entrepreneurs' external knowledge-sourcing. GEM classifies entrepreneurs into three categories based on the respondents' answers : *Nascent* entrepreneurs are those who, during the most recent twelve months, have been active in firm-creation processes, have had complete or partial ownership, and have been paid wages by the venture for not more than three months. *New* entrepreneurs are those who currently own and manage a venture and have been paid wages by the venture for more than three months but not more than forty-two months. *Established* entrepreneurs are those who own and manage a venture and have been paid wages by the venture for more than forty-two months. This categorization was repeated for each year, 2009 to 2013 (www.gemconsortium.org). Countries participate in GEM's survey by self-selection when a group of researchers in a country becomes a member of GEM, and the GEM's APS survey has evolved over time, so the survey is not consistent every year in every country. GEM collects hierarchical data through annual surveys in each participating country (Global Entrepreneurship Research Association, 2013; Minniti, 2011).

To study the institutional context, we focused on an approach to institutional adversity that research at the country level has used (Batjargal et al., 2013). Data for institutional adversity was derived from the Index of Economic Freedom (Gwartne, Lawson, & Bloc, 1996), the Political Constraint Index (POLCON) data set (Henisz, 2000), Freedom House, and Political Risk Services. Country-level control variables data was obtained from GEM's National Expert Survey (NES), and World Bank's Development Indicators dataset (WDI) for the same years. We supplemented individual-level data with country-level data, giving us 28,660 individual-level observations covering forty-seven countries from 2009 to 2013. Table 1 provides the mean values of all main study variables for each participating country in our sample.

---Insert Table 1 about here---

Individual-level Dependent Variable: New Venture Innovation

Data on new ventures' innovation was obtained from GEM's APS. New ventures' innovation is broadly considered to include both product innovation and process innovation. We used three questions from GEM's APS to measure the innovation levels of new and nascent entrepreneurs' new ventures. One question enquires about the novelty of products and services, one enquires about the competitors in the market where the ventures operate, and one asks about the technology the venture uses. Based on these questions, we determine the extent to which, the products and services are new to all customers, competitors offer the same product or service in the market where the venture functions, and the entrepreneur uses technology in the venture that was not available more than a year ago. More precisely, we develop a measure of new ventures' innovation, where observations are coded 1 if the respondent qualifies as a nascent or new entrepreneur who provides a new product or service, if no other competitors offer the

same product or service, and if the technology used in the venture was not available a year ago, and zero otherwise. Thirty-three percent of the entrepreneurs' new ventures in our sample of forty-seven countries can be considered innovative.

Individual-level Independent Variable: External Knowledge-sourcing

The dataset used in this study is a cross-sectional panel dataset grouped according by country, external knowledge sources, and new ventures' innovation, measured at the same time. In GEM's APS, a randomly selected sample of individuals aged between 18 and 64 years in each participating country was interviewed. GEM asked entrepreneurs whether they had received advice from any of a list of sixteen types of advisors (Global Entrepreneurship Research Association, 2013) in response to a perceived knowledge gap (Kuhn & Galloway, 2015). The need for advice and other types of support is especially critical at the nascent and start-up stages of the entrepreneurial process (Davidsson & Honig, 2003; Hoang & Antoncic, 2003).

We used external knowledge-sourcing as an index that captures the average level at which the entrepreneurs used the sixteen external knowledge sources for advice (Table 2).

---Insert Table 2 about here---

Types of external knowledge sources: Research has characterized networks that entrepreneurs use for advice into public networks and private networks (Schott & Sedaghat, 2014). To test our propositions, we categorized external knowledge sources that are professionals (e.g., lawyers, accountants, banks, researchers or inventors, investors, and advising services) as professional networks, external knowledge from those abroad as international networks, external knowledge from those with which the entrepreneur collaborates (e.g., competitors, suppliers, and customers) as market networks, and external knowledge from current or former colleagues, bosses, and other businesspersons as workplace networks. Table 2 provide percentages on each type of the external knowledge source being used.

Country-level Predictor Variable: institutional adversity

Data from the Index of Economic Freedom (Gwartne, Lawson, & Bloc, 1996), the POLCON data set (Henisz, 2000), Freedom House, and Political Risk Services were used to study the institutional context, that is, country-level adversity.

Following Batjargal et al. (2013), we employed institutional adversity as a combined measure of twenty variables based on factor loadings classified into three formal institutions: economic institutions (financial capital availability and market liquidity), regulatory control, and political democracy.

Data on *regulatory control* was obtained from the Index of Economic Freedom (Gwartney, Lawson, & Block 1996). This formal institution has seven main variables: contract and property rights (government protection to individuals and organizations from desecrations of exchange assurance and asset expropriation), trade policy (government control over imports and exports, such as use of tariffs and quotas), regulatory burden (government control over business behaviour, such as business registration and licensing), informal market (prevalence of uncontrolled and untaxed markets that function outside the country's government authority), government intervention in the banking sector (government regulatory influence on the financial services industry), foreign investment restriction (limitations on foreign businesses, including control of firms), and monetary policy (government participation in controlling the money supply).

Political democracy was measured with four variables using data from the POLCON dataset and the Freedom House yearly survey of civil liberties and political rights. Our two variables derived from POLCON dataset were executive political restrictions (e.g., specific constraints on executive behaviour) and political constraints (limitations on policy changes from veto power and distribution of power through political branches). The other two variables were derived from the Freedom House dataset: political rights (laws that permit citizens to

partake in government through voting) and civil liberties (human rights, including freedom of religion and freedom of speech).

Financial capital availability and market liquidity both represent the country's economic institutions. Data on *financial capital availability* was obtained from Political Risk Services (PRS). This is a combined institutional measure of six variables: (1) total foreign debts (e.g., volume of money that a country owes to other countries); (2) net reserve (e.g., the amount a country holding in terms of international reserves; (3) money supply (e.g., the amount in circulation in the economy at end of the year); (4) budget balance (e.g., difference between spending and tax revenue); (5) capital investment (e.g., amount paid against purchasing of fixed assets and capital assets); (6) nominal GDP (e.g., economic productivity for a state, not accounting for inflation).

Market liquidity is derived from three variables from PRS: liabilities (financial debts and commitments), liquidity (capacity to change assets into cash rapidly), and exchange rate (the rate at which one country's currency converts into another country's currency).

We measured country-level institutional adversity by reverse-coding the economic institutions (financial capital availability and market liquidity) and political democracy. No changes were made for regulatory control. A higher score denotes higher adverse institutions in a country, as is in the United Arab Emirates' score of 2.91, while a lower score denotes less adverse institutions in country, as in the United States' score of -3.26. Table 1 report country-level institutional adversity descriptive.

Control Variables

We included nine individual-level and three country-level control variables that previous studies have used and that are considered appropriate antecedents of external knowledge-sourcing, institutions, and innovation (Amorós, Ciravegna, Mandakovic, & Stenholm, 2018;

Schott & Sedaghat, 2014). We derived all individual-level control variables from GEM's APS: *age*, a continuous variable between 18 to 64 years old; *education* using a five-step categorical scale, where no education = 0, some secondary education = 1, secondary education = 2, post-secondary education = 3, and graduate school = 4; *gender*, a dichotomous variable where male = 1 and female = 0; *self-efficacy*, referring to the respondents' perceptions of their knowledge, skills, and experience required to start a business (1 = yes and 0 = no); *opportunity perception*, referring to whether an individual perceives a good opportunity to start a new business in the next six months (yes = 1 and 0 = no); *fear of failure*, regarding whether fear of failure stops the respondent from starting a new business (yes = 1 and 0 = no). We controlled with firm-level variables *firm owners*, as the logarithm of the number of firm owners; *firm size*, as the logarithm of the number of owner-managers plus the number of employees; and *sole proprietorship* a dichotomous variable coded 1 = if the venture is a sole proprietorship and zero otherwise.

At the country level, we controlled for population, taxes & bureaucracy, and government support & policies as institutional variables in our model. We derived countries' *total population* from the World Bank's Development Indicators (WDI) dataset for 2009-2013. The remaining two variables were derived from GEM's *Taxes and bureaucracy burden* indicates the level of taxes and other regulatory processes in a country (Levie & Autio, 2008), while *government support and policy* represents entrepreneurship-related policies (Amorós et al., 2018).

Estimation Methods

The dataset we used contains 28,660 entrepreneurs grouped into forty-seven countries, resulting in a clustered dataset. We performed two levels of analysis because we use hierarchical linear modelling (HLM) to merge individual-level data with country-level measures. Multilevel modelling is the most appropriate technique when the dataset is structured hierarchically because using ordinary least squares (OLS), a standard estimation technique,

with a clustered dataset expressively increases the chances of Type 1 errors (Hofmann, Griffin, & Gavin, 2000). Therefore, to explore the effect of individual-level external knowledge-sourcing and country-level institutional adversity on new ventures' innovation, we used multilevel random effect logistic regression. The multilevel approach was also recommended by Autio, Pathak, and Wennberg (2013) and demonstrated in their study of institutions and entrepreneurship using GEM data. Following research on multilevel modelling (Amoros et al., 2018), we explored the predictors of new ventures' innovation.

Results

Table 3 provides the mean values of all main study variables for each participating country in our sample. Our sample contains responses from 28,660 entrepreneurs who reported their external knowledge sources in terms of the four types of networks during the period of 2009-2013.

---Insert Table 3 about here---

We first examined whether the multilevel level approach with country-level effects is acceptable. The random intercept for the dependent variable, new ventures' innovation, indicates statistically significant results that support use of a multilevel approach in this study. All country-level control and predictor variables used were z-standardized because data obtained from different sources and their measurement scales differed. Using this process resulted in the common metric's (Mean = 0 and S.D = 1) providing calm and reliable interpretation of results. Table 3 illustrates the correlation matrix, descriptive statistics, and multicollinearity test for all of the study's variables. One country-level correlation was greater than 0.70, a sign of possible multicollinearity (Stephan & Pathak, 2016), so we tested the variance inflation factors (VIF) and tolerance values for all variables. The country-level variable, availability of financial capital, had the highest VIF value, 6.44, so the findings from the VIF test indicated that multicollinearity is not a concern in this study (Amoros et al., 2018).

Table 4 illustrates the effect of individual-level external knowledge-sourcing and country-level institutional adversity on individual-level new ventures' innovation and the moderating effect of institutional adversity on the relationship between external knowledge-sourcing and new ventures' innovation. The findings are specified in Odd Ratios (ORs), where an OR higher than 1 indicates a positive relationship and an OR less than 1 indicates a negative relationship. Table 4 (models 1-3) shows the random-effect logistic regression and fixed part estimates, random part estimates, and model fit statistics. Using the approach adopted from Amoros et al. (2018), we first added all individual-level and country-level control variables (model 1 in Table 4). Then we added the individual-level predictor variable external knowledge-sourcing and the country-level predictor variable institutional adversity (model 2 in Table 4), which represents the influence of external knowledge-sourcing and institutional adversity on entrepreneurs' ability to engage in innovation. Finally, we included the interaction term between individual-level external knowledge-sourcing and country-level institutional adversity (model 3 in Table 4). We used Stata 13 for all analysis.

Table 5 illustrates the effect of the various types of individual-level external knowledge-sourcing and country-level institutional adversity on individual-level new ventures' innovation and the moderating effect of institutional adversity on the relationship between the types of external knowledge-sourcing and new ventures' innovation. The findings are specified in (ORs. Models 1-6 in Table 5 show the random-effect logistic regression, fixed part estimates, random part estimates, and model fit statistics. Using the approach adopted from Amoros et al. (2018), model 1 in Table 5 shows all individual-level and country-level control variables. In model 2 in Table 5 we added all types of individual-level predictor variables—external knowledge-sourcing (average of professional, international, market, and workplace advisor networks—and country-level institutional adversity. In models 3-6 in Table 5, we included all

interaction terms between the types of individual-level external knowledge-sourcing and country-level institutional adversity.

---Insert Table 4 and Table 5 about here---

Hypothesis 1: Effect of external knowledge-sourcing on new ventures' innovation

Model 2 in Table 4 tests the relationship between external knowledge-sourcing and new ventures' innovation. The ORs indicate that entrepreneurs with high levels of external knowledge-sourcing are 47 percent more likely, on average, to enter to innovate (ORs = 1.47; $p < 0.001$).

Hypothesis 1b: Types of external knowledge-sourcing and new ventures' innovation.

Model 2 in Table 5 tests the relationship between the types of external knowledge-sourcing and new ventures' innovation. The ORs indicate that entrepreneurs who use knowledge-sourcing from professional advisor networks are 35 percent more likely, on average, to innovate (ORs = 1.35; $p < 0.001$). The ORs for entrepreneurs who use knowledge-sourcing from international advisor networks indicate that they are 28 percent more likely, on average, to innovate (ORs = 1.28; $p < 0.001$). No support was found for entrepreneurs' using market advisor networks or workplace advisor networks.

Hypothesis 2: Effect of country-level institutional adversity on new ventures' innovation

Model 2 in Table 4 shows a negative relationship between the influence of country-level institutional adversity and individual-level new ventures' innovation. The ORs of adversity show that a one-unit increase in country-level institutional adversity is linked to a 30 percent decrease in new ventures' innovation (ORs = 0.70; $p < 0.001$), supporting Hypothesis 2.

Hypothesis 3: The moderating effect of country-level institutional adversity on the relationship between external knowledge-sourcing and new ventures' innovation

The interaction term is added in model 3 (Table 4) to test our hypothesis that country-level institutional adversity moderates the relationship between individual-level external knowledge-

sourcing and new ventures' innovation. Model 3 indicates that the interaction effect of external knowledge-sourcing with new ventures' innovation (ORs = 1.28; $p < 0.01$) is positively and significantly moderated by country-level institutional adversity.

Additional analysis

Hypothesis 1b proposes that each of four types of networks will have their own unique value, so we sought to determine whether their impact on new ventures' innovation varies based on context. We ran additional analysis to test the moderating effect of adversity in institutional environments on the relationship between each type of external knowledge source and new ventures' innovation. All interaction terms are added in models 3-6 in Table 5 to test our hypothesis that country-level institutional adversity moderates the relationship between individual-level types of external knowledge networks (professional advisor networks, international advisor networks, market advisor networks, and workplace advisor networks) and new ventures' innovation. Model 3's findings (in Table 5) indicate that the effect of using a professional advisor network on new ventures' innovation (ORs = 1.07; $p < 0.01$) is positively and significantly moderated by country-level institutional adversity. We observe a positive and significant effect of the interaction between the use of an individual-level international network and country-level institutional adversity (ORs = 1.02; $p < 0.10$) on new ventures' innovation (model 4 in Table 5). Model 5 in Table 5 indicates that country-level institutional adversity positively and significantly moderates the relationship between use of a market advisor network and new ventures' innovation (ORs = 1.04; $p < 0.10$), while model 6 in Table 5 reports that the relationship between using a workplace advisor network and new ventures' innovation (ORs = 1.05; $p < 0.01$) is positively and significantly moderated by country-level institutional adversity. These outcomes confirm that institutional adversity (inefficient institutions)

strengthen the positive relationship between the type of external knowledge-sourcing and new ventures' innovation.

Robustness Analysis

To add support to Hypothesis 3, we conduct two additional robustness checks of our findings. First we divided our sample based on our measure of country-level institutional adversity into two groups using a median split and resulting in twenty-four countries in the "more adversity" group and twenty-three in the "less adversity". To examine the effect of external knowledge-sourcing and new ventures' innovation, we ran multi-group analyses with all individual-level predictor and control variables and with only country-level controls. Model 1 in Table 6 shows the findings for countries with more institutional adversity, while model 2 in Table 6 shows the findings for countries with less institutional adversity. The relationship between external network sourcing and new ventures' innovation (ORs = 1.67; $p < 0.001$) is positive and significant in the group of countries with more institutional adversity, but the relationship is not significant in the countries with less institutional adversity. These results are highly consistent with our main findings.

Second, we ran a test using only the countries with extremely high and extremely low levels of institutional adversity—the top ten in both groups. To verify the relationship between external knowledge-sourcing and new ventures' innovation, we again conducted our multilevel models reported in Table 6. Model 3 in Table 6 reports the findings from the countries with the most institutional adversity (weak and inefficient formal institutions), while model 4 in Table 6 reports the findings from the countries with the least institutional adversity (strong and efficient formal institutions). Model 3 in Table 6 shows that external knowledge-sourcing (ORs = 1.79; $p < 0.001$) are positively and significantly related to new ventures' innovation in the group of countries with the highest level of institutional adversity, a relationship that is stronger

than when we equally distributed our sample of countries in model 1 of Table 6. On the other hand, this relationship was not significant in the group of countries with the least institutional adversity (model 4 in Table 6). These findings confirm our original results and support Hypothesis 3.

---Insert Table 6 about here---

In addition to the above analyses following the comments of the reviewers on the very high values on new venture innovation from Saudi Arabia and Indonesia, we decided to drop these two countries from our final sample and re-run the analysis reported in table 4. Our main results in terms of hypotheses 1a, 2 and 3, did not change. Therefore, we decided to keep them in our final sample of analysis.

Discussion and future research

Table 7 summarizes the analyses we performed. The literature on innovation management explains that a firm's effectiveness in managing its new product development processes depends on its external knowledge-sourcing (Gambardella & Panico, 2014; Laursen & Salter, 2014; Robertson, Casali, & Jacobson, 2012). Although research in general has addressed external knowledge-sourcing, research in the entrepreneurship context is scarce (Chesbrough & Bogers, 2014). Our study contributes to the literature on external knowledge-sourcing by linking it with the entrepreneurship literature, building on the idea that new ventures face pivotal challenges like capital resource constraints, a lack of market knowledge, and limited commercialization and networking opportunities. The study's findings show that external knowledge-sourcing can help entrepreneurs overcome some of these challenges in highly adverse environments, but future research should investigate the mechanisms that facilitate or prevent external knowledge-sourcing activity (Ketchen, Ireland, & Snow, 2007; West & Bogers, 2014).

---Insert Table 7 about here---

We used the KBV to identify and examine four types of external knowledge-sourcing that are relevant to the entrepreneurial context. In doing so, we contribute to calls to explore types of external knowledge-sourcing in order to determine the type of network that is most beneficial to innovation (Cao, Peng, & Liu, 2015; Kuhn & Galloway, 2015; Mors, 2010). We built our multidimensional model with four types of external knowledge sources and found that professional and international networks play an important role in new ventures' innovation, whereas market and workplace networks do not. This latter finding contrasts with the entrepreneurship literature that emphasizes that a new venture should consult with customers, suppliers, and competitors (Arora et al. 2001; Fritsch & Lukas, 2001; Tether, 2002; Veugelers, 1997). Our study advances this stream of research by synthesizing existing research findings and providing empirical evidence of the overall influence of types of external knowledge-sourcing on new ventures' innovation.

Our main objective was to integrate insights from institutional theory (Ostrom, 2005a, 2005b; Ostrom, Schroeder, & Wynne, 1993) to examine the moderating role of institutional environments on the relationship between external knowledge sourcing and new venture innovation. In doing so, we follow Batjargal et al.'s (2013) argument that a single institution or several institutions may not affect a new venture's entrepreneurial outcomes directly in its early stage of development (Tzeng et al., 2011). We called the combined measure institutional country-level institutional adversity.

The results of this study reveal how country-level institutional adversity in the institutional environment influences whether external professional, international, market, or workplace networks are beneficial for new ventures' innovation. Our study provides evidence of the contingent nature of the type of external knowledge-sourcing as they relate to formal institutions' effects on new ventures' innovation. In particular, the study helps to explain that the multiplicity of institutions as part of institutional polycentrism plays an important role in

new ventures' ability to achieve positive entrepreneurial outcomes through various types of external knowledge-sourcing. Thus, we contribute to discussions on the interactive influence of multiple types of formal institutions (operationalized as "country-level institutional adversity") and external knowledge-sourcing on entrepreneurial outcomes (Gassmann et al., 2010; Phelps et al., 2012).

Managerial Implications

Our work s implications for entrepreneurs and owners of small businesses. External knowledge-sourcing is the best way to strengthen new ventures' competitive position in the market. New ventures can learn from external ideas, knowledge, and problem-solving approaches, which can help them identify opportunities for innovation. We also suggest that entrepreneurs join key knowledge networks platforms, which may increase the quality of knowledge exchanged and identify conditions under which valuable knowledge is more likely to be shared. We promote networking and information-sharing among members. With the availability of the internet and with societal changes, entrepreneurs should be inclined to connect with geographically dispersed peers to acquire new knowledge. One example is FoodHub, located in the United States, which helps businesses get business-related advice and market their products. Entrepreneurs can use such industry-focused platforms to increase their competitive advantage. Entrepreneurs in highly institutionally adverse contexts should engage heavily in external knowledge-sourcing activities to survive and acquire a competitive edge.

Public policy implications

Governments should promote business-support programs to enhance knowledge-sharing activities and launch more mentoring programmes to ease connections between the best professionals in an industry and the industry's new ventures. International knowledge sources

are also important for new ventures' innovation. With the availability of the internet and societal changes, governments should also act entrepreneurially. For example, MyEntre.Net is the state of Iowa's platform that promotes both in-person and online interactions among small business owners. More such programmes should be launched to increase innovation activity in new ventures. Such external knowledge-sourcing programmes could be even more useful in highly adverse contexts, when regulatory, political, and economic conditions are not conducive to entrepreneurship.

Limitations

Although we used a large-scale sample of entrepreneurs with data from independent sources for the country-level predictors, our study is not free from limitations. We focused on different sources of external knowledge, all of which could be expensive for entrepreneurs with limited financial resources to reach. In this case, effectuation logic theory could help us understand what leads to different forms of external knowledge-sourcing. Further research on the dark side should investigate the likelihood of excessive dependence on external knowledge-sourcing, which might limit new ventures' innovation.

Another limitation is that we based our data set on the GEM database, which provides data only on individuals' traits, behaviours, and intentions during a fixed period of time. Therefore, we were unable to examine how external knowledge-sourcing and institutions co-evolve to support new ventures' innovation. A longitudinal study that uses a cross-country data set at an individual level could survey how external knowledge-sourcing evolves over time to facilitate new ventures' innovation.

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Table 1. Country Overview: Descriptive Statistics and Mean Values

	N[a]	INO %[a]	EKS[a]	REG[b]	POL[d]	FIN[g]	MKL[g]	ADV
Algeria	395	31.65	0.14	-0.43	0.14	0.19	-2.27	-1.07
Angola	423	42.32	0.26	-1.09	1.53	0.29	0.23	0.77
Argentina	592	25.00	0.18	-1.47	-1.2	0.16	0.57	-1.26
Australia	148	25.68	0.33	2.01	-1.76	-0.39	0.85	0.38
Bangladesh	231	8.23	0.09	-1.28	0.18	0.31	0.93	0.06
Bolivia	1,128	22.25	0.08	-0.9	-0.04	0.33	-0.36	-0.48
Botswana	907	22.38	0.23	1.08	0.03	0.33	0.41	1.17
Brazil	609	19.54	0.09	-0.38	-0.49	-0.22	-0.53	-0.81
China	1,121	29.79	0.03	-1.38	2.41	-4.65	-1.56	-1.87
Colombia	4,987	45.08	0.22	0.69	-0.07	0.24	0.29	0.75
Costa Rica	260	23.08	0.14	0.71	-1.32	0.33	0.9	0.23
Czech Republic	83	37.35	0.18	1.66	-1.76	0.23	0.9	0.46
Denmark	96	33.33	0.23	1.5	-1.76	0.06	0.35	0.02
Ecuador	923	35.75	0.12	-1.14	0.46	0.32	1.09	0.43
Egypt, Arab Rep.	163	33.74	0.16	0.08	1.17	0.3	0.57	1.42
Ghana	1,211	17.75	0.07	0.19	-0.66	0.34	0.97	0.41
Greece	94	43.62	0.29	0.67	-1.25	0.16	1.07	0.26
Guatemala	778	24.04	0.06	0.17	-0.25	0.33	0.88	0.63
Hungary	496	21.98	0.22	1.37	-1.2	0.24	0.3	0.39
India	193	44.56	0.14	-1.12	-1.27	-0.23	0.45	-1.33
Indonesia	1,171	63.71	0.15	-0.23	-0.59	-0.01	-1.13	-0.99
Iran, Islamic Rep.	1,027	14.61	0.17	-2.43	2.23	0.29	-2.78	-1.05
Ireland	105	26.67	0.28	2.25	-1.55	-0.33	1.16	0.85
Israel	122	45.08	0.27	0.93	-1.55	0.24	0.22	-0.17
Malaysia	328	29.57	0.1	0.87	-0.29	0.2	-0.44	0.33
Mexico	669	24.96	0.12	1.03	-0.72	-0.08	0.66	0.55
Nigeria	2,297	25.51	0.15	-0.57	-0.03	0.27	0.42	0.08
Pakistan	502	31.27	0.18	-0.62	0.06	0.3	0.63	0.23
Peru	1,505	37.74	0.11	1.12	-0.17	0.25	-0.04	0.79
Philippines	441	56.46	0.11	-0.11	-0.96	0.23	0.03	-0.49
Poland	303	27.72	0.22	0.87	-1.34	0.08	0.56	0.04
Portugal	71	32.39	0.18	0.99	-1.12	0.16	0.95	0.49
Romania	291	34.02	0.29	1.08	-0.11	0.25	0.12	0.89
Saudi Arabia	178	71.91	0.25	0.81	2.41	-0.14	-2.59	0.98
South Africa	426	56.57	0.17	0.29	-0.64	0.2	0.68	0.29
Suriname	66	34.85	0.14	-1.53	-0.8	0.34	0.81	-0.82
Sweden	41	34.15	0.29	1.19	-1.67	-0.11	0.83	0.05
Syrian Arab Republic	153	43.79	0.29	-1.06	1.02	0.32	0.18	0.41
Thailand	1,229	29.62	0.18	0.21	0.34	0.16	0.22	0.67
Tunisia	157	29.94	0.01	-0.5	1.75	0.32	0.91	1.63
Turkey	444	47.30	0.21	0.71	0.03	0.03	0.32	0.75
United Arab Emirates	193	42.49	0.35	1.03	2.23	0.17	1.03	2.91
United States	207	22.22	0.32	2.12	-1.61	-3.3	-4.28	-3.26
Uruguay	578	29.58	0.18	0.77	-1.28	0.32	0.34	0.02
Venezuela, RB	237	23.63	0.07	-2.85	0.86	0.23	0.56	-0.65
Vietnam	310	16.13	0.16	-1.17	1.12	0.28	-2.77	-1.05
Zambia	771	26.72	0.13	-0.34	-0.06	0.34	0.08	0.07

Notes:
N represents the total number of individual-level responses from each country;
INO% represents the percentage of entrepreneurs considered for innovation in each country;
EKS shows the aggregated mean of professional network, international network, market network and workplace network in each country.

REG shows aggregated score for *regulatory control* in each country; POL shows aggregated score for p*olitical democracy* in each country; FIN shows aggregated score for *financial capital availability* in each country; MKL shows aggregated score for *market liquidity* for each country.
ADV shows aggregated score for country level *institutional adversity*, combined measure of four main variables (REG, reversed POL, reversed FIN, reversed MKL).
Sources: [a]Adult Population Survey (APS) from Global Entrepreneurship Monitor (GEM) 2009–2013;
Sources: [b] Index of Economic Freedom (IEF) (2009-2013).
Sources: [d] Freedom House (2009-2013).
Sources: [c] POLCON (2009-2013).
Sources: [g] Political Risk Services (2009-2013).

Table 2. External Knowledge Sourcing Types

Type	Network source	Percentage	
	"Various people may give you advice on your new business. Have you received advice from any of the following?"	Yes	No
Professional advisors' network	A public advising services for business	9.02	90.98
	A possible investor	12.30	87.70
	An accountant	13.53	86.47
	A bank	8.29	91.71
	A lawyer	7.86	92.14
	A researcher or inventor	7.43	92.57
International advisors' network	Some body in another country	10.86	89.14
	Somebody who has come from abroad	10.66	89.34
Market advisors' network	A firm that you collaborate with	11.60	88.40
	A firm that you compete with	8.44	91.56
	A supplier	22.50	77.50
	A customer	33.44	66.56
Workplace advisors' network	A current work colleagues	27.99	72.01
	A current boss	10.99	89.01
	Somebody who is starting a business	23.01	76.99
	Somebody with much business experience	34.83	65.17

Table 3. Correlation Matrix, Descriptive Statistics and Multicollinearity

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Main variables (individual-level)																							
1.	New Venture Innovation	1.00																					
2.	Professional advisors' network (PRF)	.058**	1.00																				
3.	International advisors' network (INT)	.060**	.404**	1.00																			
4.	Market advisors' network (MKT)	.038**	.530**	.318**	1.00																		
5.	Workplace advisors' network (WP)	.043**	.504**	.378**	.519**	1.00																	
Main variables (country-level: Institutional Adversity)																							
6.	Regulatory control	.084**	.151**	.097**	.126**	.088**	1.00																
7.	Political democracy	-.054**	-.057**	-.035**	-.056**	-.031**	-.542**	1.00															
8.	Financial capital availability	.008	.061**	.075**	.088**	.087**	.182**	-.389**	1.00														
9.	Market liquidity	.013*	.009	.078**	.009	.006	.348**	-.445**	.422**	1.00													
Control variable (individual-level)																							
10.	Age	-.003	-.002	-.027**	-.021**	-.064**	.069**	-.065**	-.027**	.010	1.00												
11.	Gender	-.009	.080**	.066**	.072**	.111**	.002	.027**	.007	-.038**	.002	1.00											
12.	Education	.041**	.196**	.124**	.152**	.152**	.125**	-.002	-.034**	-.115**	-.098**	.070**	1.00										
13.	Self-efficacy	.022**	.042**	.046**	.055**	.055**	.037**	-.065**	.089**	.042**	.010	.035**	.074**	1.00									
14.	Opportunity perception	.033**	.039**	.041**	.053**	.052**	.046**	-.016**	.091**	.106**	-.040**	-.010	-.012	.159**	1.00								
15.	Fear of failure	-.026**	.012*	-.015**	.017**	.005	-.027**	.022**	-.026**	-.050**	.026**	-.020**	-.025**	-.158**	-.098**	1.00							
16.	Firm owner	.021**	.150**	.091**	.095**	.155**	.050**	.000	.030**	-.016**	-.029**	.070**	.140**	.008	.007	-.011	1.00						
17.	Firm size	.023**	.163**	.084**	.118**	.141**	.010	.071**	-.047**	-.069**	.013*	.094**	.122**	.010	-.015**	-.002	.584**	1.00					
18.	Sole proprietorship	-.011	-.140**	-.079**	-.107**	-.157**	-.099**	.027**	-.036**	.011	.087**	-.056**	-.171**	.015**	.008	.008	-.657**	-.337**	1.00				
19.	Baby business	-.045**	-.026**	-.045**	.026**	-.058**	-.081	-.100**	.076**	.112**	.014**	-.022**	-.041	-.021**	-.039**	.023**	-.072**	.234**	.122**	1.00			
Control variables (country-level)																							
20.	Population (million)	.004	-.101**	-.097**	-.101**	-.102**	-.329**	.390**	-.893**	-.349**	.003	-.009	-.008	-.091**	-.067**	.040**	-.064**	.017**	.080**	.094**	1.00		
21.	Taxes and bureaucracy	.056**	.011	.025**	.029**	-.007	.354**	.244**	-.146**	-.045**	.015**	.008	.102**	-.047**	.064**	.022**	.054**	.058**	-.060**	.061**	.056**	1.00	
22.	Government support and policies	.111**	.048**	.038**	.074**	.020**	.306**	.069**	-.099**	-.006	.039**	.024**	.133**	-.039**	.022**	.030**	.027**	.038**	-.073**	.085**	.023**	.688**	1.00
	Mean	0.33	0.09	0.10	0.19	0.24	61.3839	2.5055	256.4349	515.2329	35.78	0.57	1.85	0.84	0.70	0.27	4.24	2846.25	0.6564	0.47	125504601	2.2531	2.4574
	Standard Deviation	0.47	0.19	0.27	0.26	0.28	9.57	0.75	729.76	1175.39	11.18	0.49	1.10	0.36	0.46	0.44	47.01	53768.26	0.47493	0.49	274243216	0.35	0.41
	Min	0	0	0	0	0	37.29	0.75	1.45	0.72	18	0	0	0	0	0	0	1.00	0	0	542540	1.47	1.69
	Max	1.00	1.00	1.00	1.00	1.00	85.04	3.84	5026.61	7015.71	64	1.00	1.00	1.00	1.00	1.00	1.00	2000998	1.00	1.00	1357380000	3.44	4.54
	VIF		1.68	1.28	1.60	1.61	2.66	2.37	6.44	1.52	1.03	1.02	1.11	1.07	1.06	1.04	2.47	1.77	1.83	1.18	6.18	2.70	1.99
	Tolerance		0.59	0.78	0.62	0.62	0.37	0.42	0.15	0.65	0.97	0.97	0.90	0.93	0.94	0.96	0.41	0.56	0.54	0.85	0.16	0.37	0.50

*** p < 0.001, ** p < 0.01, * < p 0.05
Individual-level variables: N = 28,660
Country-level variables: N = 47

VIF scores larger than 10 indicates the collinearity issue among the study variables.
Tolerance scores lesser than 0.1 indicate the collinearity issue among the study variables.

Table 4. Predicting individual-level new venture innovation (A combined measure of External Knowledge Source)

	1	2	3
Fixed part estimates			
Control variables (Individual-level)			
Age	0.99**(0.00)	0.99**(0.00)	0.99**(0.00)
Gender	0.94*(0.02)	0.93*(0.02)	0.93*(0.02)
Education	1.01(0.01)	0.99(0.01)	0.99(0.01)
Self-efficacy	1.06+(0.04)	1.05(0.04)	1.05(0.04)
Opportunity perception	1.08**(0.03)	1.08*(0.03)	1.08*(0.03)
Fear of failure	0.91**(0.03)	0.91**(0.03)	0.91**(0.03)
Firm owner	1.01*(0.03)	1.01(0.03)	1.01(0.03)
Firm size	1.09***(0.02)	1.08***(0.01)	1.08***(0.01)
Sole proprietorship	1.16***(0.04)	1.17***(0.04)	1.17***(0.04)
Baby business	0.74***(0.02)	0.75***(0.02)	0.75***(0.02)
Control variables (Country-level)			
Population	1.04(0.14)	0.83(0.13)	0.82(0.13)
Taxes and bureaucracy	0.69***(0.03)	0.80***(0.04)	0.80***(0.04)
Government support and policies	1.28***(0.06)	1.19***(0.06)	1.19***(0.06)
Main Effect (Individual-level)			
H1a: External Knowledge Source (EKS)		**1.47***(0.10)**	1.37***(0.10)
Main Effects (country-level)			
H2: Institutional Adversity		**0.70***(0.04)**	0.67***(0.04)
Cross-level interaction terms			
H3: External Knowledge Source X Adversity			**1.28**(0.10)**
Random part estimates			
Number of observation	28,660	28,660	28,660
Number of group (countries)	47	47	47
Model fit statistics			
Degree of freedom (number of variables)	13	15	16
Chi-square	250.08	308.21	316.43
Prob > Chi-square	***	***	***
Log likelihood	-17,171	-17,139	-17,135
LR test for goodness of fit	***	***	***

Notes: Stander errors were reported in parentheses. All significances are reported at two-tailed test, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Estimates in Model 1-3 were reported in odd ratios (ORs), ORs above 1 shows a positive relationship while ORs less than 1 shows a negative relationship.

Table 5. Predicting individual-level new venture innovation (Types of External Knowledge Source)

	1	2	3	4	5	6
Fixed part estimates						
Control variables (Individual-level)						
Age	0.99**(0.00)	0.99**(0.00)	0.99**(0.00)	0.99**(0.00)	0.99**(0.00)	0.99**(0.00)
Gender	0.94*(0.03)	0.93*(0.03)	0.93*(0.03)	0.93*(0.03)	0.93*(0.03)	0.93*(0.03)
Education	1.01(0.01)	0.99(0.01)	0.99(0.01)	1.00(0.01)	0.99(0.01)	0.99(0.01)
Self-efficacy	1.06+(0.04)	1.06(0.04)	1.05(0.04)	1.06(0.04)	1.05(0.04)	1.06(0.04)
Opportunity perception	1.09*(0.03)	1.08*(0.03)	1.07*(0.03)	1.07*(0.03)	1.07*(0.03)	1.07*(0.03)
Fear of failure	0.91**(0.03)	0.91**(0.03)	0.91**(0.03)	0.91**(0.03)	0.91**(0.03)	0.91**(0.03)
Firm owner	1.01(0.03)	1.01(0.03)	1.01(0.03)	1.01(0.03)	1.01(0.03)	1.00(0.03)
Firm size	1.09***(0.02)	1.08***(0.01)	1.08***(0.01)	1.08***(0.01)	1.08***(0.01)	1.08***(0.01)
Sole proprietorship	1.16***(0.04)	1.17***(0.04)	1.16***(0.04)	1.16***(0.04)	1.16***(0.04)	1.17***(0.04)
Baby business	0.74***(0.02)	0.75***(0.02)	0.75***(0.02)	0.75***(0.02)	0.75***(0.02)	0.75***(0.02)
Control variables (Country-level)						
Population	1.05(0.14)	0.84(0.13)	0.83(0.13)	0.80(0.13)	0.83(0.13)	0.83(0.13)
Taxes and bureaucracy	0.69***(0.03)	0.80***(0.04)	0.79***(0.04)	0.78***(0.04)	0.79***(0.04)	0.80***(0.04)
Government support and policies	1.28***(0.06)	1.19***(0.06)	1.20***(0.06)	1.21***(0.06)	1.20***(0.06)	1.20***(0.06)
Main Effect (Individual-level: **H1b**)						
Professional network (PRF)		**1.35***(0.12)**	1.29**(0.12)	1.35***(0.12)	1.35***(0.12)	1.34***(0.12)
International network (INT)		**1.28***(0.07)**	1.28***(0.07)	1.23***(0.07)	1.28***(0.07)	1.28***(0.07)
Market network (MKT)		**0.97(0.06)**	0.97(0.06)	0.96(0.06)	0.94(0.06)	0.97(0.06)
Workplace network (WP)		**0.96(0.06)**	0.96(0.06)	0.96(0.06)	0.96(0.06)	0.92(0.05)
Main Effects (country-level)						
Institutional Adversity		**0.71***(0.04)**	0.69***(0.04)	0.70***(0.04)	0.69***(0.04)	0.68***(0.04)
Cross-level interaction terms						
Professional network X Adversity			**1.07**(0.02)**			
International network X Adversity				**1.02+(0.02)**		
Market network X Adversity					**1.04+(0.09)**	
Workplace network X Adversity						**1.05**(0.02)**
Random part estimates						
Number of observation	28,660	28,660	28,660	28,660	28,660	28,660
Number of group (countries)	47	47	47	47	47	47
Model fit statistics						
Degree of freedom (number of variables)	13	18	19	19	19	19
Chi-square	250.08	329.72	332.72	332.19	332.39	335.62
Prob > Chi-square	***	***	***	***	***	***
Log likelihood	-17,171	-17,128	-17,127	-17,174	-17,127	-17,125
LR test for goodness of fit	***	***	***	***	***	***

Notes: Stander errors were reported in parentheses. All significances are reported at two-tailed test, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$. Estimates in Model 1-6 were reported in odd ratios (ORs), ORs above 1 shows a positive relationship while ORs less than 1 shows a negative relationship.

Table 6. Post hoc analysis: Predicting individual-level new venture innovation

	Equally distributed		Only top 10 adverse and low adverse	
	High Adverse Countries	Low Adverse Countries	Top High Adverse Countries	Top Lower Adverse Countries
	Model 1	Model 2	Model 3	Model 4
Fixed part estimates				
Control variables (Individual-level)				
Age	0.99**(0.00)	0.99(0.00)	0.99*(0.00)	0.99(0.00)
Gender	0.94+(0.03)	0.91*(0.04)	0.92+(0.04)	0.95(0.06)
Education	0.98(0.02)	1.02(0.02)	0.97(0.02)	1.00(0.03)
Self-efficacy	1.05(0.05)	1.06(0.06)	1.03(0.07)	1.11(0.09)
Opportunity perception	1.08*(0.04)	1.05(0.05)	1.09+(0.06)	1.07(0.07)
Fear of failure	0.89**(0.04)	0.94(0.04)	0.88*(0.05)	0.95(0.06)
Firm owner	1.06+(0.04)	0.94(0.05)	1.02(0.05)	0.99(0.07)
Firm size	1.07**(0.02)	1.09***(0.02)	1.09**(0.03)	1.10**(0.03)
Sole proprietorship	1.15**(0.05)	1.22**(0.07)	1.08(0.06)	1.42***(0.13)
Baby business	0.73***(0.03)	0.78***(0.03)	0.69***(0.03)	0.78**(0.05)
Control variables (Country-level)				
Population	0.51(0.90)	1.08(0.15)	0.89 (3.15)	1.02(0.18)
Taxes and bureaucracy	0.62***(0.03)	1.04(0.10)	0.61***(0.03)	1.69**(0.28)
Government support and policies	1.45***(0.08)	0.78**(0.08)	1.49***(0.10)	0.56***(0.07)
Main Effect (Individual-level)				
External Knowledge Sourcing (EKS)	1.67***(0.15)	1.12(0.14)	1.79***(0.20)	0.76(0.14)
Random part estimates				
Variance of intercept	0.39(0.12)	0.42(0.14)	0.61(0.29)	0.55(0.25)
Number of observations	15,962	12,698	8,909	5,691
Number of group (countries)	24	23	10	10
Model fit statistics				
Degree of freedom (number of variables)	14	14	14	14
Chi-square	276.29	66.09	229.06	65.71
Prob > Chi-square	***	***	***	***
Log likelihood	-9,924	-7,196	-5,788	-3,168
LR test for goodness of fit	***	***	***	***

Notes: Stander errors were reported in parentheses.

Estimates in Model 1 and 2 were reported in odd ratios (ORs), ORs above 1 shows a positive relationship while ORs less than 1 shows a negative relationship.

All significances are reported at two-tailed test, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

Table 7: Summary of results

	Main analysis		Robustness analysis	
Tables	**Table 4**	**Table 5**	**Table 6**	
Models	**Model 2-3**	**Mode 2**	**Mode 1-2**	**Mode 3-4**
Objective	To test hypotheses 1a, 2 and 3	To test hypothesis 1b	Data analyzed as part of additional robustness test for hypothesis 3.	Data analyzed as part of additional robustness test for hypothesis 3.
Countries and cases	47 countries with 28600 respondents	47 countries with 28600 respondents	24 countries from high adversity group and 23 countries from low adversity group with total of 28600 respondents	10 countries in extreme adversity group and 10 countries from lowest adversity group with total of 14600 respondents
Findings	Positive relationship between external knowledge sourcing and new venture innovation (H1a); Institutional adversity negatively impacts new venture innovation (H2); This relationship is strengthened when institutional adversity is high (H3).	Positive relationship between external knowledge sourcing type of professional and international with new venture innovation (H1b); Institutional adversity negatively impacts new venture innovation (H2); The relationship between different types of the external knowledge sourcing moderated by institutional adversity	The relationship between external knowledge sourcing and new venture innovation positive and significant in case of high adversity group but not significant in case of low adversity group. This further supports our hypothesis 3.	The relationship between external knowledge sourcing and new venture innovation positive and significant in case of extreme high adversity group but not significant in case of lowest adversity group. This further supports our hypothesis 3.

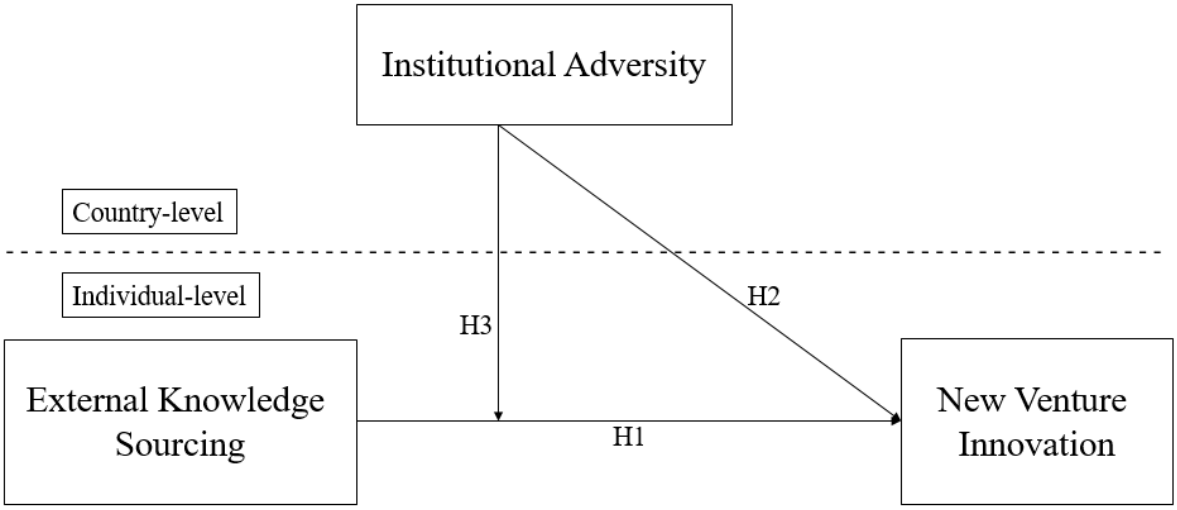

Figure 1. Research Framework