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Does country environment matter in the relationship between intellectual capital and innovation performance?

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ABSTRACT

This paper examines how country environment shapes the relationship between firm intellectual capital and its innovation performance. Using survey data from 649 firms in Finland, Spain and Russia complemented by archival IMD World Competitiveness Ranking data, we find that when country environment is characterised by greater availability of skilled labour and a stronger appropriability regime, a firm's human and structural capital have a lower impact on its innovation performance. The effect of relational capital does not depend on these contextual variables. This study enriches the intellectual capital-based view of the firm by demonstrating that country-level factors moderate the performance effects of firm-level intellectual capital. It also adds to the strategic management literature by exploring the explanatory power of a combination of country-level variables and firm-level resources in understanding firm-level performance. Our findings can help practitioners focus on the elements of intellectual capital that have the greatest impact in their environment.

1. Introduction

The literature on the knowledge-based view of the firm considers knowledge as a critical strategic resource that significantly influences firm performance (Grant, 1996; Spender, 1996). It posits that intellectual capital, as a combination of knowledge located in various repositories — employees, relations and management systems (human, relational and structural capital, respectively) — plays an important role in organisational innovativeness (Subramaniam & Youndt, 2005; Barrena-Martínez et al., 2020). Rooted in the resource-based view (Barney, 1991), this stream of research sees intellectual capital as one of those rare, idiosyncratic, and hard-to-imitate firm-level resources that help firms gain competitive advantage.

At the same time, the strategic management literature argues that in its pure form, the resource-based view is limited in explaining variations in firm-level performance because it overlooks the impact of external environments on defining those firm resources that could be the most valuable or productive (Miller & Shamsie, 1996; Priem & Butler, 2001). This line of research suggests that a firm's competitive advantage depends not only on the valuable resources it possesses, but also on the external environment in which these resources are acquired and exploited. Studies here have claimed that the value of a certain resource, as well as a firm's capability to appropriate the rents generated by this resource, varies according to the environmental settings; hence, these settings should be studied to obtain a better understanding of how a resource influences performance (Oliver, 1997; Wan, 2005; Peng et al., 2009). In other words, there have been calls for the integration of different perspectives in the strategic management literature, including factors both internal and external to the firm, to better explain the sources of firm competitive advantage.

A country environment has been demonstrated to be an important contextual factor that can explain the relationship between firm-specific resources and outcomes, especially in emerging economies and, more broadly, in the international arena (e.g., Meyer et al., 2009; Hoskisson et al., 2013; Kim et al., 2015; Kafouros & Aliyev, 2016). Along these lines, Wan (2005) and Wan and Hoskisson (2003) proposed a conceptual framework that describes the country environment as a combination of factors (or country-level resources) and institutions that jointly shape firms' capabilities to accumulate firm-level resources and extract value from them.

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However, only a few studies have applied these ideas to explain the firm-level performance effects of knowledge resources. Lu et al. (2008) theorised that the institutional environment influences firm knowledge resources and innovation by imposing expectations and requirements about what knowledge can be accumulated and how it can be acquired and used, as well as by allocating incentives for knowledge creation, transfer and application. Bilgili et al. (2016) postulated that country resource environments shape the learning strategies firms choose and the external sources of knowledge they use by influencing the costs involved. Empirically, the institutional context has been found to moderate the performance effect of knowledge creation capability (Su et al., 2016) and the effect of intangible assets on foreign subsidiary growth (Kafouros & Aliyev, 2016).

However, exploration of the environmental boundary conditions that may make a firm's intellectual capital more or less powerful in influencing firm performance is in the nascent stage (Inkinen et al., 2017; Buenechea-Elberdin, 2017). Building on this emerging line of research, we suggest that the intellectual capital view of the firm (Reed et al., 2006) would benefit from a more systematic acknowledgement of the role of the external environment. A better understanding of these boundary conditions could extend both the intellectual capital theory and knowledge-based view of the firm, making them more context sensitive (Bamberger, 2008; Whetten, 2009) and helping practitioners direct their managerial efforts towards developing intellectual capital components that have the most impact in their environment.

To address this, our study aims to provide a more fine-grained and contextualised understanding of the performance implications of firm-level intellectual capital by exploring the role of country-level conditions. We build on the Wan and Hoskisson theoretical framework (Wan and Hoskisson, 2003; Wan, 2005) and theorise that two country-level factors — skilled labour availability and appropriability regime — are the key characteristics of the country environment that may shape how intellectual capital influences firm innovation performance. We define *skilled labour availability* as the availability of knowledgeable and skilled individuals in the country's labour market (Chacar et al., 2010; Kwan & Chiu, 2015); and *appropriability regime* as a combination of available and effective means of protecting innovations from imitation (Hurmelinna-Laukkanen & Puumalainen, 2007). We test our research hypotheses with data from a survey of 649 firms in Finland, Spain and Russia, which are complemented by archival Institute for Management Development (IMD) World Competitiveness Ranking data. Our analysis indicates that human and structural capital are more useful for boosting a firm's innovation performance in skilled labour-poorer environments with weaker appropriability regimes, while the effects of relational capital do not depend on these aspects of the environment.

With these findings, our study makes several contributions to the literature. First, our paper enriches the intellectual capital-based view of the firm (Reed et al., 2006; Subramaniam & Youndt, 2005; Youndt et al., 2004) by identifying and empirically exploring two country-level factors — skilled labour availability and appropriability regime — that moderate the performance effects of firm-level intellectual capital. It also enables us to better understand the findings of the existing studies on the performance effects of intellectual capital by interpreting them in the context of the country environment where the data were collected. In this way, our study provides a more nuanced understanding of the performance effects of firm-level intellectual capital in different country-level contexts, hence responding to the calls for more contextualisation of the theories (Bamberger, 2008; Whetten, 2009). Second, our study adds to the strategic management literature by exploring the explanatory power of a combination of country-level variables and firm-level resources (e.g., Wan & Hoskisson, 2003; Wan, 2005; Peng et al., 2009; Kim & Hoskisson, 2015) to better understand the firm-level performance of knowledge resources. In doing so, the present paper contributes to the nascent research that explores external boundary conditions for the efficiency of internal knowledge resources (Lu et al., 2008; Bilgili et al., 2016). On the practical level, our findings may help practitioners channel their managerial efforts towards developing the intellectual capital components that could have the most impact in their context.

2. Conceptual background and research hypotheses

2.1. Intellectual capital and innovation

The concept of intellectual capital refers to all the knowledge embedded in an organisation that can be used for the creation of competitive advantage (Nahapiet & Ghoshal, 1998; Reed et al., 2006; Subramaniam & Youndt, 2005; McDowell et al., 2018). Previous literature has conceptualised the structure of intellectual capital in a variety of ways, identifying from two to nine constituting elements (for a review, see Inkinen, 2015). Despite this variability, there seems to be a broadly accepted agreement concerning the three core dimensions of intellectual capital: human capital, relational (or social) capital and structural (or organisational) capital (Subramaniam & Youndt, 2005; Reed et al., 2006; Barrena-Martínez et al., 2020; McDowell et al., 2018).

Each of these elements of intellectual capital has been theorised to contribute positively to firm innovation performance (e.g., Subramaniam & Youndt, 2005; Kianto et al., 2017; McDowell et al., 2018). However, the existing empirical evidence does not provide a clear picture. Different components of intellectual capital or different synergistic effects between them have been found to influence innovation performance (e.g., see Buenechea-Elberdin, 2017; Kianto et al., 2017; Subramaniam & Youndt, 2005; Wu et al., 2008). For example, some researchers have suggested that managers should focus on developing relational capital to promote innovation because new ideas for innovations appear as a result of demand from the market (Zhang & Lv, 2015). At the same time, other studies have suggested that human capital is the key prerequisite for innovation because it is people who are able to challenge the status quo, come up with new ideas and flexibly learn new needed skills (e.g., Youndt & Snell, 2004).

One of the potential explanations for these inconsistencies lies in the insufficient attention paid to the external environment in which the studied relationships have taken place. Therefore, the differences in the findings can be due to some underlying contextual issues that cause variations in the relationships between intellectual capital elements and innovation performance. Several recent studies have pointed to the need to anchor intellectual capital within the wider environmental context (Inkinen et al., 2017; Buenechea-Elberdin, 2017). However, there have been very few attempts in the empirical research to contextualise the performance effects of intellectual capital. For example, Reed et al. (2006) explored the industry-specific effects in the banking industry, Buenechea-Elberdin et al. (2018) examined the differences in the intellectual capital–innovation links between high-tech and low-tech industries, and Tovstiga and Tulugurova (2009) compared the competitive impact of intellectual capital across four geographical regions. Apart from these studies, the question of how the external environment may shape the intellectual capital–performance relationship and, more specifically, how it impacts the intellectual capital–innovation performance relationship, has been virtually neglected.

2.2. Country environment as an important contextual variable

The lack of attention to the country environment by intellectual capital studies may stem from their conceptual origins rooted in the resource-based view of the firm (Penrose, 1959; Barney, 1991). Indeed, as it is focused on the internal sources of competitive advantage and heterogeneity among firms (Barney, 1991; Mahoney & Pandian, 1992), the resource-based view has been criticised for largely overlooking the role of the external environment (Priem & Butler, 2001). To address these concerns, the strategic management literature has explored the role of the external environment and the opportunities it provides for extracting value from firm-specific resources (Miller & Shamsie, 1996; Peng et al., 2009; Kim & Hoskisson, 2015). In this research, the country environment has been demonstrated to

be an important moderator of the relationships between firm-specific resources and firm-level outcomes (e.g., Kim et al., 2015; Kafouros & Aliyev, 2016). Therefore, our study focuses on the country environment as a contextual country-level variable that may influence the firm-level capacity to benefit from its intellectual capital.

Building on the insights from institutional economics (North, 1990), Wan and Hoskisson (2003) and Wan (2005) conceptualised the country environment as consisting of two major dimensions: factors (e.g., physical infrastructure and available resources) and institutions (e.g., legal system). In their view, variations in the availability and quality of factors, together with varied institutional arrangements, create different sets of opportunities and constraints for conducting firm activities. In reaction to them, firms choose different strategies regarding what resources to acquire, what capabilities to develop and what outcomes to aim for (Wan, 2005). In other words, Wan and Hoskisson (2003) and Wan (2005) defined the country context as *both* a resource environment that provides firms with the resources for carrying out their business and an institutional environment that shapes firms' choices on how to use their resources. Subsequently, Kim and Hoskisson (2015) labelled this approach as a resource environment view of competitive advantage.

According to this framework, when the country environment is rich in a particular resource, many firms in this environment could potentially acquire this resource and benefit from such a location-specific advantage. This has been widely evidenced in the international business literature, demonstrating that multinational companies move across borders to leverage the benefits from locally bound resources (Kedia & Mukherjee, 2009; Mukherjee et al., 2019). Although not every firm in a country possesses equally high levels of a particular resource, wide availability of a resource makes it relatively easier and cheaper for a firm to acquire that resource if it sees that their competitors are faring better thanks to it (Kim & Hoskisson, 2015). Therefore, if a resource is widely available on the market, it is likely to be possessed by many firms, thus becoming less unique and rare and, consequently, less valuable for creating a sustainable competitive advantage for the firm (Barney, 1991). Contrarily, if a firm succeeds in accumulating a resource that is scarce in the country environment, it gains a comparative advantage over its competitors.

At the same time, the institutional environment surrounding resources and resource strategies may enhance or inhibit their optimal use (Oliver, 1997). The institutional environment includes legal rules and government structures (formal institutions), as well as ideology and culture (informal institutions) (Kaufmann et al., 2018). The institutional environment may limit diversity by constraining the range of permitted resource options available to firms (Oliver, 1997). Moreover, institutions influence the opportunity of a firm to exploit a resource fully and appropriate the rents it generates (Peng et al., 2009; Kafouros & Aliyev, 2016). For example, in countries where the rule of law is well established, companies perform business activities with greater confidence because the legal rules are explicit and clear to managers. When disputes arise, firms may use legal processes to secure justice (Elango & Lahiri, 2014). In countries where the rule of law is not the norm, firms may avoid making any additional investments as they are aware that their property rights are poorly protected.

This two-dimensional framework and its elements have been widely used to explore the interaction between firm-level resources and a country's environment in predicting firm performance (e.g., Kim et al., 2015; García-García et al., 2017; Zhu et al., 2019; Adomako & Danso, 2014). We propose that it also suits well for describing the external environment of developing and using firm-level intellectual capital across different countries. Indeed, although the different elements of intellectual capital represent the idiosyncratic resources belonging to a firm, the possibility of acquiring them depends on the *availability of resources* in the external environment. The resource-based view posits that firms can acquire knowledge resources either through cumulative firm experience and learning by doing (Oliver, 1997) or by buying them in the factor market (Barney, 1986). Therefore, the availability of knowledge resources in the factor market is relevant for developing a firm's intellectual capital. Furthermore, the literature has argued that the institutional arrangements may influence firms' perceptions of which knowledge is particularly valuable to acquire (Lu et al., 2008) and whether the rents from this knowledge can be appropriated (Kafouros & Aliyev, 2016). In other words, the opportunity for a firm to use the intellectual capital it has accumulated efficiently and effectively depends on the *institutional environment* that governs what a firm can do with this intangible resource and how.

Therefore, we build on Wan and Hoskisson's framework (Wan and Hoskisson, 2003; Wan, 2005) to explore how country environment shapes the relationship between firm-level intellectual capital and innovation performance. Each element of this framework — namely resource availability and institutional environment — will be explored separately below.

2.3. Research hypotheses

2.3.1. Country resource environment: the role of skilled labour availability in the intellectual capital–innovation performance relationship

Among the various resources available to companies in the market, skilled and knowledgeable labour is the most relevant factor that can either boost or block the influence of firm-level intellectual capital on innovation performance. Indeed, the quality of skills possessed by the employees of a firm depends not only on the firm-specific investments in people, but also on the availability of this resource in the labour market — for example, on the types of skills, the level of these skills and the number of qualified individuals available (Kwan & Chiu, 2015). And these are highly qualified employees who enable a firm to apply its intangible assets efficiently and effectively. For example, the capacity of a firm to benefit from its relationships with others (that is relational capital) to enhance its innovation performance depends on the skills of the employees who enact these relationships (Kamprath & Mietzner, 2015). Similarly, the effectiveness of a firm's structures and knowledge repositories (that is structural capital) depends on the qualifications of the employees who use them (Bowman & Swart, 2007; Garavan et al., 2001). Finally, the usefulness of the knowledge that individual employees have (that is human capital) is enhanced when they can collaborate with highly knowledgeable and skilled colleagues because innovation is a collaborative process (Nonaka & Takeuchi, 1995; Ritter & Gemünden, 2003).

If the country environment is rich in skilled labour, many firms will have the opportunity to benefit from this location-specific advantage (e.g., Budhwar et al., 2006; Lahiri et al., 2012; Kedia & Mukherjee, 2009). This will enable more firms to access this resource more easily when they want to leverage their existing intellectual capital and amplify its impact on innovation performance. As more firms are able to do so, according to the resource-based view, it will become relatively more difficult to create sustainable competitive advantages (Barney, 1991). In addition, when highly skilled candidates are readily available in the labour market, there is less need for a firm to invest in in-house training, creating the potential for knowledge to move more easily across firms (Chacar et al., 2010). It may lead to an increase in interfirm employee mobility that becomes less limited by firm-specific knowledge (Campbell et al., 2012), which is an isolating mechanism that prevents workers from taking their valuable knowledge and skills to rival firms (Barney, 1991). The increase in employee turnover will lead to the transfer of information and skills to other firms (Campbell et al., 2012; Bowman & Swart, 2007), making it more difficult to achieve better innovative performance when compared with competitors. Therefore, when skilled worker knowledge becomes less distinctive, the source of the firm's competitive advantage dissipates (Chacar et al., 2010). In other words, skilled labour availability in the country's market can minimise the performance discrepancies between the firms in that market by accelerating imitation and enabling poorly performing firms to catch up faster with the competition while imposing losses on superior performing firms (Chacar et al., 2010). On the other hand, if skilled labour is in limited supply in the country environment, a firm that has been successful in accumulating this resource receives a comparative advantage over its competitors, and this

resource may become a fundamental source of abnormal returns (Spender, 1996). This claim has been empirically found to hold true for indigenous firms, as they are often perceived to be less attractive for employees compared to multinational companies and, thus, are exposed more to the negative effects of greater availability of skilled labour in their home market (Chacar et al., 2010).

Therefore, we anticipate the following:

Hypothesis 1:. *When the country environment is characterised by greater availability of skilled labour, the contribution of intellectual capital [(a) human, (b) structural and (c) relational capital] to company innovation performance relative to competitors will be weaker.*

2.3.2. Country institutional environment: the role of appropriability regime in the intellectual capital–innovation performance relationship

We propose that among different features of the institutional environment, the appropriability regime that is set by the country's legal framework is of particular relevance to the efficiency of the organisation's knowledge base and innovation efforts (Su et al., 2016). An appropriability regime represents 'a combination of available and effective means of protecting intangibles and innovations, their profitability and the increased rents' (Hurmelinna-Laukkanen & Puumalainen, 2007, p. 95). A situation whereby the institutional environment protects intellectual property rights and supports fair competition by establishing legal protection for agreements and contracts is associated with a *strong* appropriability regime (Hurmelinna-Laukkanen & Puumalainen, 2007; Hurmelinna et al., 2007; Murphy et al., 2012). Institutional support of patenting and knowledge licensing can lead to an increase in knowledge variety and allow companies to deploy, recombine and use ideas that will lead to better innovation performance (Galunic & Rodan, 1998; Zhong & Sun, 2020). Registered patents are the most widely used formal appropriation mechanism adopted by firms, encouraging companies to integrate and utilise their knowledge in different markets to generate greater innovation (Bahl et al., 2021). Furthermore, a strong appropriability regime ensures that collaboration partners do not abuse each other when they share new ideas. This not only enables fair competition, but also creates more opportunities for innovation because when the environment provides better protection for the company's knowledge assets, companies feel more confident to collaborate with each other as they are less afraid that their secrets and ideas may be stolen (Ritala et al., 2015). Therefore, when the legal framework supports a strong appropriability regime via fair competition and protects knowledge and intangible assets, the contribution of such assets (i.e., intellectual capital) to firm innovation performance will be stronger.

In contrast, a *weak* appropriability regime is characterised by an institutional environment that allows for patent and copyright violations and counterfeits and makes it difficult to monitor and enforce contracts (Li & Zhang, 2007; Zhong & Sun, 2020). Such a weak institutional environment negatively affects the differences in a firm's ability to generate rents and develop strategic assets (Oliver, 1997), making it difficult for a firm to profit from the intangible resources it has (Su et al., 2016). A weak legal and regulatory system may lead to unfair competition, poaching key employees from competitors, a lack of trust in relations with counterparts and knowledge leakage that may negatively influence a company's innovation performance. A weak appropriability regime may also reduce the potential of idea recombination, diminishing employees' incentives to share ideas and innovate because people are afraid that their ideas may be stolen (Henttonen et al., 2016; Hurmelinna et al., 2007).

In sum, we anticipate the following:

Hypothesis 2:. *When the country environment provides a stronger appropriability regime (i.e., a more favourable legal framework for fair competition and knowledge protection), the contribution of intellectual capital [(a) human, (b) structural and (c) relational capital] to company innovation performance relative to competitors will be stronger.*

The conceptual model of our study is visualised in Fig. 1.

3. Methodology

3.1. Context of the study

To empirically examine our hypotheses, we focused on three countries: Finland, Russia and Spain. These three countries represent an interesting set for a study focusing on the peculiarities of the context, as the diversity among these countries in relation to resource availability and institutional environment allows for insightful comparisons (Meyer, 2015). Our comparative set of countries includes one emerging economy (Russia) and two developed ones. Among the two developed economies in our sample, one is considered to be very knowledge intensive (Finland; European Commission, 2014a), while the other is not, often being labelled a 'brick-based' economy (Spain; European Commission, 2014b). The details of how we measured the country's environmental characteristics are provided below in the 'Moderating variables' section.

3.2. Sample and data collection

Our targeted population was a broad group of firms across many industries and regions; this was done to maximise the variation of the variables and increase the generalisability of the findings. We only targeted firms with at least 100 employees because such organisations are likely to have somewhat formalised management and innovation systems. This size limit led us to focus only on manufacturing companies in Russia because Russian service companies are typically rather small. Country-specific databases were utilised to identify companies. Data collection took place from October 2013 to November 2013 in Finland, from October 2013 to February 2015 in Spain and from January to April 2015 in Russia. All data collection was conducted via telephone interviews. In Finland and Russia, the data were collected by an external market research company, while the researchers collected the data in Spain. These slight differences in sampling and data collection procedures across the three countries are considered reasonable in multi-country research (Parry et al., 2021). The key informant technique was followed, and confidentiality was emphasised to the respondents.

Altogether, 234 usable responses were received from Finland, 175 from Spain and 240 from Russia (i.e., 659 in total). Across all the countries, most of the respondents held top-level management positions, indicating their expertise and providing a good overview of intellectual capital and innovation issues in the firm. The Finnish and Spanish companies represented a wide variety of industries, including manufacturing, wholesale and retail trade, miscellaneous services and transportation and storage. The Russian sample included various manufacturing sectors, such as machinery, vehicles, food, consumer goods, etc.

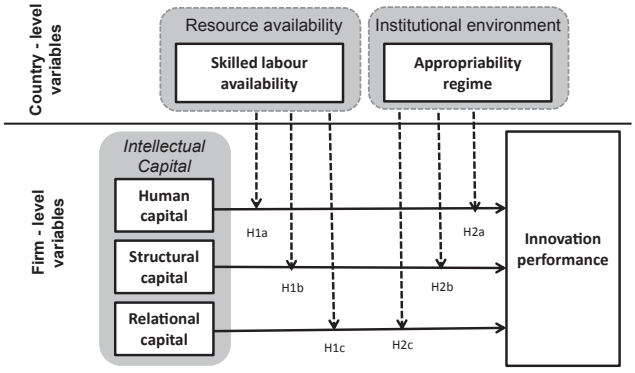

Fig. 1. Conceptual model.

3.3. Measures

The research instrument was developed in English. It was translated into Finnish, Spanish and Russian by experts who were knowledgeable about the topic and fluent in their national language and in English to ensure construct equivalence (Harzing, 2005; Harzing et al., 2013; Parry et al., 2021).

3.3.1. Independent variables

The intellectual capital components' measures were adapted from the literature and developed by the research team that was led by the last coauthor. First, a thorough literature review was conducted to find empirically validated measurement scales for intellectual capital. After that, to confirm the operational validity and psychometric robustness of the scales, the survey was translated into Finnish and pretested on a dataset of Finnish managers (N = 151). After the initial development, the questionnaire was translated back into English and further polished in the consultation process with an international panel of experts to ensure the viability of the research instrument in the international context.

The scales for this study consist of nine items measuring the three key components of intellectual capital. All the scales were measured by asking the respondents to assess how the different statements on intellectual capital dimensions applied to the organisation they represented on a 5-point Likert scale anchored by 'I strongly agree/disagree'. The *human capital* scale consisted of three items, adapted from Bontis (1998) and Yang and Lin (2009). The *structural capital* items (3) were based on Kianto (2008) and Kianto et al. (2010), and the three *relational capital* items were taken from Kianto (2008).

3.3.2. Dependent variable

The *innovation performance* scale was adopted from Weerawardena (2003). Here, the respondents were asked to compare their company's success with that of their competitors in terms of creating various types of innovations. The scale (Likert scale from 1 — very poorly — to 5 — very well) consisted of four items.

3.3.3. Moderating variables

We used the IMD World Competitiveness Ranking to measure the institutional environment as it provides the indicators relevant to the concepts we were interested in (skilled labour availability and appropriability regime) and has been used in prior research (e.g., Pearce et al., 2011; Cherchye & Verriest, 2016). We studied the IMD methodology carefully and decided to focus only on the indicators from a survey of executives around the world, excluding "objective" indicators like percentages, money and so forth. This decision ensured that the data were consistently comparable across the various items, all measured on a 0 to 10 scale. We reviewed the indicators and selected those reflecting the concepts of skilled labour availability (six indicators) and an appropriability regime (four indicators) in a particular country. Following Pearce et al. (2011), we used a full IMD dataset from 63 countries to run a factor analysis of these conceptually preselected indicators. We applied an oblimin rotation with Kaiser normalisation and dropped items that loaded<0.40 on the target factor or showed less than a 0.10 difference in loadings on more than 1 factor. The factor analysis for the year 2012 is presented in Table 1.

A robustness check was done by repeating this analysis on the data from four different years (2011–2014); this is available upon request. This process resulted in two 4-item scales for skilled labour availability and appropriability regime, with strong convergent and discriminant validity, as presented in Table 2.

To minimise the effects of year-to-year volatility (Snell & Youndt, 1995), we calculated a three-year average of the selected IMD indicators prior to the year when the sample companies were surveyed. Since the sample companies were surveyed in different years, we applied the 2010–2012 average of the IMD indicators for Finland, the 2010–2012 or 2011–2013 (depending on the year when the company was surveyed) average for Spain and the 2012–2014 average for Russia. The values of the three-year averaged indicators of skilled labour availability and appropriability regime from the IMD World Competitiveness Ranking for Finland, Spain and Russia are presented in the Appendix.

Table 1
Factor analysis of the key country environment factors that influence the impact of intellectual capital on innovation.

IMD indicator	Factor 1	Factor 2	AVE	CR	α
Skilled labour availability			0.66	0.88	0.914
Skilled labour is readily available		0.975			
Qualified engineers are available in your labour market		0.918			
Digital/technological skills are readily available		0.700			
Competent senior managers are readily available	0.383	0.609			
Appropriability regime			0.78	0.93	0.927
The legal and regulatory framework encourages the competitiveness of enterprises	0.895				
Intellectual property rights are adequately enforced	0.866				
Competition legislation is efficient in preventing unfair competition	0.965				
Development and application of technology are supported by the legal environment	0.786				

3.3.4. Controls

A number of other factors, apart from intellectual capital, may influence firm innovation performance. To eliminate these effects, we controlled for the impact of three issues. First, in line with Kianto et al. (2017), we accounted for the size of the companies, which is measured as a natural logarithm of the number of employees reported by the survey respondents. Second, we controlled for the companies' R&D intensity, in line with Cohen and Levinthal (1990), which is measured by assessing the proportion of R&D staff relative to all the employees. Third, we controlled for servitisation as previous research (e.g., Kianto et al., 2010) has suggested that manufacturing and service companies may have different configurations of intellectual capital elements that, in turn, might make different contributions to their performance.

3.4. Assessment of potential biases

We followed a number of procedural and statistical steps to ensure that common method bias (CMB) would not influence the results (Podsakoff et al., 2012). First, we pretested the survey with managers and an international panel of experts to ensure that the wordings of our scale items were clear and comprehensible in all three languages. Second, we explicitly assured our respondents of the anonymity of the information they shared to increase the likelihood of honest answers. Third, we used top-level managers as informants, as they are well informed about their organisations.

After the data were collected, we performed statistical analyses to evaluate the existence of CMB. To determine the level of method variance in the dataset, we carried out a full collinearity test developed specifically for structural equation modelling (SEM) based on partial least squares (PLS) (Kock, 2015), which involved both vertical (predictor–predictor) and lateral (predictor–criterion) collinearity analyses. We applied this technique as Kock (2015) demonstrated that it outperforms other methods, such as a confirmatory factor analysis, in identifying common method bias. Our highest VIF was 1.602; thus, CMB is unlikely to be a problem in this dataset (Kock, 2015).

3.5. Methods of analysis

To test our hypotheses, we used SEM based on PLS, with SmartPLS 3.2.8

Table 2
IMD scales characteristics, descriptive statistics and correlation between the variables.

						Correlations, Square root of AVE in diagonal	
IMD indicator	Cronbach's α	Composite reliability	AVE	Mean	Std.Dev.	1	2
Skilled labour availability	0.914	0.88	0.66	6.386	0.946	0.812	
Appropriability regime	0.927	0.93	0.78	5.743	1.383	0.495	0.883

software. PLS-SEM is conceived to work especially well with composites (Hair et al., 2017; Henseler, 2017; Llanos-Contreras et al., 2020; Manley et al., 2020; Danks et al., 2020). We applied mode 'A' estimation as it is recommended for models with small to medium R^2 values (Sarstedt et al., 2016).

4. Findings

4.1. Measurement model evaluation

We started by analysing our measurement model to check for individual item reliability, construct reliability, convergent validity and discriminant validity. We used the baseline model for this evaluation (i.e., excluding moderating variables and moderation effects). Table 3 summarises the results of our analysis and demonstrates that all parameters yield values above the recommended thresholds (e.g., Hair et al., 2017).

To check discriminant validity, we used the heterotrait–monotrait (HTMT) approach (Henseler, 2017). Table 4 indicates that all the confidence intervals built by bootstrapping met the required condition because all their upper limits were lower than one.

Finally, Table 5 shows the correlations between the constructs.

4.2. Structural model evaluation

We tested the strength of the proposed relationships between the constructs by employing a 5000 subsample, bias-corrected and accelerated (BCA) bootstrap (Hair et al., 2017). The results of the baseline model (see Table 6) show that all intellectual capital components exert a significant influence on innovation performance, with structural capital having the strongest and relational capital the weakest influence among the three. Moreover, the larger the company, the higher its R&D intensity and the higher its servitisation degree, the better the innovation performance of the firm compared with its competitors. The baseline model explains 22.5% of the variation in innovation performance.

We ran six additional models to explore the moderation effects of skilled labour availability and appropriability regime at the country level on the intellectual capital–innovation relationship, testing each moderation effect independently. As can be observed in Table 7, resource availability negatively moderates the relationship between two of the three components of intellectual capital and innovation performance. This moderation effect is statistically significant for the human capital–innovation performance link and for the structural capital–innovation performance link. Thus, hypotheses H1a and H1b are accepted, while hypothesis H1c is rejected. Regarding the appropriability regime, the latter negatively moderates the relationship between the same two components of intellectual capital and innovation performance, which is contrary to our expectations. Namely, this moderation effect is statistically significant for the human capital–innovation performance relationship and for the structural capital–innovation performance relationship. Hence, hypotheses H2a, H2b and H2c are all rejected but in different ways: we found the opposite relationship for H2a and H2b, while no relationship was found for H2c.

5. Discussion

Building on the strategic management literature positing that firm-level resources must be considered in combination with the country-level environment to explain firm-level performance, we examined the role of country-level availability of skilled labour and appropriability regime in the relationship between firm-level intellectual capital and innovation performance.

Our findings suggest that when a country environment is associated with greater availability of skilled labour, the contribution of human and structural capital to a company's innovation performance becomes weaker. This is in line with our expectations that the capacity of the firm to amplify the effects of its intellectual capital and bring about better innovative performance compared with competitors will be lower when this opportunity is less rare and unique. However, we did not find support for our hypothesis related to relational capital. Our results suggest that the relationship between firm-level relational capital and innovation performance does not depend on country-level skilled labour availability. We posit that this discrepancy can be explained by the very nature of relational capital. Even though it is the people who develop relations, they do so in the context of the specific firm. Each business is unique, and the knowledge generated from each relationship is difficult to replicate (Chetty et al., 2006). Moreover, relational capital is built through the repeated exchanges between partners (Blonska et al., 2013; Barrena-Martínez et al., 2020) and is based on affective commitment (Wasko & Faraj, 2005) and partnership quality (Lahiri et al., 2012), both of which help leverage and integrate common knowledge to facilitate innovations (Ritala & Hurmelinna-Laukkanen, 2009; Xie et al., 2018). Therefore, relational capital is so embedded in specific partner dyads that its effect on innovation performance may not be leveraged by the availability of generic skills in the market.

In sum, our findings related to the role of the resource environment suggest that the effectiveness of intellectual capital, which is a firm-specific resource, may depend on the resource availability in the factor market, thus supporting the ideas of Wan (2005), Wan and Hoskisson (2003) and Kim and Hoskisson (2015). At the same time, our findings indicate that not all firm-specific resources are equal in that some of them are more idiosyncratic than others (i.e., relational capital) and that the effectiveness of such a firm-specific resource may not depend on the external resource environment.

In terms of the institutional environment, our findings suggest that when a country environment provides a strong appropriability regime, the contribution of human and structural capital to a company's innovation performance becomes weaker, which is contrary to our expectations. Our hypothesis was based on the assumption that a stronger appropriability regime provides better knowledge protection and fairer competition, thus increasing the effectiveness of the knowledge assets (Henttonen et al., 2016). However, some studies have suggested that a stronger appropriability regime may also have negative effects. Although the purpose of a strong appropriability regime is to prevent the unwanted transfer of ideas, it can also obstruct knowledge transfer in situations in which it would be preferable to happen (Hurmelinna et al., 2007). For example, by being aware of the strong protection of intellectual property rights, employees may become more careful in sharing their knowledge both inside and outside their firm, as they are afraid of unintentional knowledge leakage and the resulting punishments (Ritala et al., 2015). Yet the threat of knowledge leakage may overshadow the benefits of knowledge sharing between firms at professional fairs, exhibitions or other formal or informal occasions (Hamel, 1991; Ritala et al., 2015). Furthermore, environments with strong appropriability regimes are often characterised by the wide usage and enforcement of noncompete contracts, whereby employees commit themselves not to work for their former employers' competitors if

Table 3
Measurement model evaluation, Part I (baseline model) (1 of 2).

Constructs and measures	Item wording	Parameters	Descriptives	
Controls			Mean	SD
Size	Natural logarithm of the number of employees	N.A.	5.700	0.959
R&D intensity	Proportion of R&D staff of all employees.	N.A.	7.96%	12.232
Servit. Degree	Proportion of service sales	N.A.	39.42%	36.846
Independent variables				
Human capital (Mode A comp.)	1 to 5 Likert scales	$\rho_c = 0.876$		
		AVE = 0.702		
		Loadings	Mean	SD
HC1	Our employees are highly skilled in their jobs.	0.796	4.071	0.685
HC2	Our employees are highly motivated in their work.	0.838	3.700	0.809
HC3	Our employees have a high level of expertise.	0.877	4.025	0.696
Structural capital (Mode A comp.)	1 to 5 Likert scales	$\rho_c = 0.849$		
		AVE = 0.652		
		Loadings	Mean	SD
SC1	Our company has efficient and relevant information systems to support business operations.	0.815	3.684	0.940
SC2	Our company has tools and facilities to support cooperation between employees.	0.816	3.744	0.869
SC3	Our company has a great deal of useful knowledge in documents and databases.	0.790	3.849	0.922
Relational capital (Mode A comp.)	1 to 5 Likert scales	$\rho_c = 0.881$		
		AVE = 0.712		
		Loadings	Mean	SD
RC1	Our company and its external stakeholders—such as customers, suppliers and partners—understand each other well.	0.832	3.877	0.726
RC2	Our company and its external stakeholders frequently collaborate to solve problems.	0.841	3.720	0.856
RC3	Cooperation between our company and its external stakeholders runs smoothly.	0.857	3.824	0.787
Innovation performance (IP) (Mode A composite)	1 to 5 Likert scales	$\rho_c = 0.892$ AVE = 0.674		
	Compared to its competitors, how successfully has your company managed to create innovations in the following areas during the past year?			
		Loadings	Mean	SD
IP1	Products and services for customers.	0.757	3.459	0.947
IP2	Production methods and processes.	0.849	3.351	0.991
IP3	Management practices.	0.856	3.316	0.963
IP4	Business models.	0.820	3.184	0.981

ρ_c: composite reliability; AVE: average variance extracted; SD: standard deviation.

Table 4
Measurement model evaluation, Part II—Discriminant validity (baseline model).

Relationships	HTMT	5%	95%
R&D intensity → Size	0.006	0.000	0.014
Servitisation degree → Size	0.125	0.063	0.186
Servitisation degree → R&D intensity	0.132	0.073	0.187
Human capital → Size	0.122	0.059	0.195
Human capital → R&D intensity	0.076	0.027	0.115
Human capital → Servitisation degree	0.082	0.041	0.142
Structural capital → Size	0.161	0.093	0.228
Structural capital → R&D intensity	0.078	0.027	0.135
Structural capital → Servitisation degree	0.079	0.032	0.132
Structural capital → Human capital	0.693	0.636	0.748
Relational capital → Size	0.123	0.063	0.189
Relational capital → R&D intensity	0.075	0.025	0.133
Relational capital → Servitisation degree	0.133	0.075	0.204
Relational capital → Human capital	0.580	0.517	0.643
Relational capital → Structural capital	0.608	0.538	0.674
Innovation performance → Size	0.173	0.108	0.232
Innovation performance → R&D intensity	0.179	0.121	0.231
Innovation performance → Servitisation degree	0.098	0.053	0.146
Innovation performance → Human capital	0.410	0.325	0.492
Innovation performance → Structural capital	0.480	0.397	0.554
Innovation performance → Relational capital	0.374	0.286	0.453

HTMT: heterotrait–monotrait ratios.

the employment relationship ends (Henttonen et al., 2016). These considerations may explain why the effects of both human and structural capital on innovation performance are negatively moderated by a country's appropriability regime.

Regarding relational capital and appropriability regimes, our findings differ: they indicate that relational capital is equally effective in both weak and strong appropriability regimes. This may be explained by the fact that companies build different types of relationships in different institutional environments. In strong appropriability regime situations, companies are more open to collaboration with a wider range of partners, including cooperation with competitors, because they feel their knowledge is protected (Ritala & Hurmelinna-Laukkanen, 2009; Henttonen et al., 2016). Under weak appropriability regimes, where the outcomes of cooperation are not protected by intellectual property rights, firms select their potential partners based on other criteria and tend to form networks with non-competing entities to gain access to complementary assets and combine different types of knowledge (Dahlander & Wallin, 2006; Hurmelinna et al., 2007; Lee & Cavusgil, 2006). Both types of relationships provide, albeit in different ways, useful opportunities to boost innovation (e.g., Ritala & Hurmelinna-Laukkanen, 2009). Therefore, although the nuanced mechanisms of the effect of relational capital on innovation performance may differ, this effect will remain positive under different appropriability regimes.

Taken together, our results indicate that the more favourable the country environment is (both in terms of resource availability and formal institutions), the lower the influence of human and structural capital on innovation performance, while relational capital retains its effect in both more and less favourable environments. These conclusions shed new light on some studies of the performance effects of intellectual capital by putting their findings into context. For example, Subramaniam and Youndt (2005) explored the relationship between intellectual capital elements and performance indicators using samples from US organisations. According to the IMD data and the measures we propose, the USA scores high in both skilled labour availability and appropriability regime. Subramaniam and Youndt (2005) found that relational capital has a positive significant effect on all types of innovation performance, while the effects of human and structural capital vary from insignificant to negatively significant depending on the type of innovation considered. These results can be explained by a favourable

Table 5
Correlation matrix.

	1	2	3	4	5	6	7
1. Size	1.000						
2. R&D intensity	0.006	1.000					
3. Servitisation degree	−0.125***	0.132***	1.000				
4. Human capital	0.116**	0.061*	−0.079*	1.000			
5. Structural capital	0.138***	0.067*	−0.067*	0.533***	1.000		
6. Relational capital	0.110**	0.068*	−0.118**	0.462***	0.465***	1.000	
7. Innovation performance	0.158***	0.161***	0.091*	0.345***	0.380***	0.305***	1.000

***p < 0.001, **p < 0.01, *p < 0.05 (based on one-tailed tests).

Table 6
Structural model evaluation (baseline model).

R^2 = 22.5%	β	STDEV	*t* statist.	*p* values	5%	95%
Size	0.111	0.033	3.377	0.000	0.055	0.163
R&D intensity	0.110	0.029	3.846	0.000	0.061	0.156
Servitisation degree	0.133	0.036	3.637	0.000	0.071	0.192
Human capital	0.159	0.049	3.254	0.001	0.078	0.238
Structural capital	0.224	0.043	5.178	0.000	0.152	0.294
Relational capital	0.124	0.047	2.612	0.005	0.047	0.200

β: path coefficient; STDEV: standard deviation. *P* values are based on one-tailed tests.

country environment in which their data were collected; this is in line with our study's predictions.

5.1. Implications for theory

Our study makes several contributions to the literature. First, it extends the intellectual capital-based view of the firm (Reed et al., 2006) by proposing that the differences in country environments have an enduring impact on the relationship between firm-level intellectual capital and innovation performance and by providing empirical evidence for this idea. More specifically, we conceptually identify and empirically confirm two country-level factors that moderate the effect of a firm's intellectual capital on its innovation performance: the availability of skilled labour in the market and appropriability regime. We also demonstrate that various elements of intellectual capital depend on the external environment to a different extent.

In doing so, our findings strengthen the intellectual capital-based view of the firm by overcoming its limitation of focusing on the internal capabilities of the firm and disregarding its external environment, which is inherited from the resource-based view (Priem & Butler, 2001; Peng et al., 2009). In addition, the two factors we identified could be used to both interpret the conflicting findings of past research and contextualise the results of future studies of intellectual capital better by interpreting them in the context of the country environment where the data were collected. Since we built on the IMD information, which contains open and comparable data for a large set of countries, our approach makes it possible to compare various studies, even if they originally did not account for the country-level factors. In sum, our approach provides a more nuanced understanding of the performance effects of intellectual capital in different country environments, thus contributing to the development of a more context-sensitive theory (Whetten, 2009).

Second, we contribute to the discussion in the strategic management literature, which has suggested that firm-level resources have to be considered in combination with the country-level environment to explain firm-level performance (Wan & Hoskisson, 2003; Wan, 2005; Peng et al., 2009; Kim & Hoskisson, 2015). We do this by providing empirical evidence on how country-level skilled labour availability and appropriability regime moderate the relationship between firm-level intellectual capital and innovation performance. Although a lot of the empirical work in this area has focused on multinational companies (e.g., Kim et al., 2015; Kafouros & Aliyev, 2016), we demonstrate that the same argument applies to indigenous companies and their use of knowledge-based resources. We also add to this discussion by demonstrating that firm-level resources vary in their dependence on the country environment. In doing so, we contribute to the nascent research that has explored the external boundary conditions for the efficiency of internal knowledge resources (Lu et al., 2008; Bilgili et al., 2016).

5.2. Implications for practice

Our findings have several practical implications for managers. First, our findings suggest that organisations operating in countries with a high availability of skilled employees will benefit less from investments in human and structural capital, as investing in them will contribute less to comparative innovation performance. At the same time, firms functioning in less favourable environments, for example, in emerging countries, would benefit strongly from investing in human and structural capital — therefore, managers of such firms may want to focus on

Table 7
Moderation effects.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Size	0.130***	0.120***	0.126***	0.130***	0.121***	0.127***
R&D intensity	0.127***	0.120***	0.120***	0.127***	0.120***	0.120***
Servitisation degree	0.086*	0.090**	0.085*	0.085*	0.088**	0.083*
Human capital (HC)	0.129**	0.128**	0.151**	0.129**	0.129**	0.152**
Structural capital (SC)	0.219***	0.222***	0.226***	0.219***	0.223***	0.226***
Relational capital (RC)	0.161**	0.155**	0.164***	0.161***	0.155**	0.164***
Skilled labour availability (SLA)	0.156*	0.144*	0.151*			
Appropriability regime (AR)				0.159**	0.148**	0.154**
HCxSLA	−0.103*					
SCxSLA		−0.142**				
RCxSLA			−0.032			
HCxAR				−0.105*		
SCxAR					−0.142**	
RCxAR						−0.033
R^2	25.3%	26.0%	24.4%	25.4%	26.1%	24.5%

***p < 0.001, **p < 0.01, *p < 0.05 (based on one-tailed tests).

these aspects. Furthermore, our study suggests that managers in any country environment would be better off prioritising their investments in developing relational capital if they want to boost the innovation performance of their organisations, as this component of intellectual capital retains its influence in both strong and weak appropriability regimes and in both resource-rich and resource-poor markets.

5.3. Research limitations and future research directions

This study is not without limitations, which also point to potential future research directions. First, we considered only the legal framework supporting the appropriability regime as an element of the institutional environment of a country. Other elements of the institutional environment, both formal and informal, could be considered in future research. Future studies may want to investigate the additional characteristics of country environments or their combinations, for example, analysing country environments with direct and indirect government regulations (e.g., Fabro & Aixalá, 2012) or hybrid country environments with abundant factors but inadequate institutions or vice versa (e.g., using Hoskisson et al.'s (2013) typology). Studies may also explore whether different kinds of factors and institutions influence each other in a complementary or conflicting manner. Such an analysis can expand our understanding of how country environment influences the relationships between intellectual capital elements and innovation performance.

Next, we based our analysis on the data from only three countries and, thus, have a limited variation of country-level variables and their combinations. Future research would benefit from applying our conceptual framework to other countries with different environmental characteristics or to a larger set of countries (like Cherchye & Verriest, 2016) to extend the external validity of our findings.

Furthermore, this study only focused on the country environment as a contingency for the effects of intellectual capital. Existing literature suggests that industry characteristics might be another important external contingency that could explain the effectiveness of firm-level resources (e.g., Miller & Shamsie, 1996; Chuang et al., 2013; Elango & Dhandapani, 2020). Looking at industry environmental characteristics together with country environmental characteristics (e.g., Su et al., 2016) will allow for the contextualising of the effects of intellectual capital in a more comprehensive way. Such future studies would be in line with the 'strategy tripod' perspective (Peng et al., 2009; Lahiri et al., 2020), which integrates firm-level resources, country-level institutions and industry-level characteristics as sets of complementary conditioning factors of firms' competitiveness.

Finally, we acknowledge that there are also firm-level factors and competencies (e.g., managerial capabilities or entrepreneurial orientation) that may influence the relationship between intellectual capital elements and innovation performance (e.g., Lahiri et al., 2012; Wu et al., 2008; Bahl et al., 2021). Future studies may benefit from integrating country-level, industry-level and firm-level contingencies to explain the performance effects of knowledge resources.

Despite these limitations, our findings contribute to the intellectual capital-based view of the firm by demonstrating the relevance of the country-level environment to understand the firm-level performance effects of intellectual capital, enabling the reconciliation of some discrepancies in past empirical research in this area and paving the way for more nuanced contextualised exploration of this important resource.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Comparison of skilled labour availability and appropriability regime IMD indicators in Finland, Spain and Russia

IMD indicators	Average 2010–2012		Average 2011–2013	Average 2012–2014
	Finland	Spain	Spain	Russia
Skilled labour availability indicators				
1. Skilled labour is readily available	7.36	6.17	6.71	6.06
2. Qualified engineers are available in your labour market	8.52	7.64	7.83	6.09
3. Digital/technological skills are readily available	8.72	6.99	7.16	7.41
4. Competent senior managers are readily available	6.45	4.90	5.14	5.05
IMD indicators average score	7.76	6.42	6.71	6.15
Appropriability regime indicators				
1. The legal and regulatory framework encourages the competitiveness of enterprises	6.42	3.72	3.62	2.82
2. Intellectual property rights are adequately enforced	8.48	6.00	5.81	3.96
3. Competition legislation is efficient in preventing unfair competition	7.64	6.26	6.08	3.13
4. Development and application of technology are supported by the legal environment	7.84	6.19	6.26	4.98
IMD indicators average score	7.60	5.54	5.44	3.72

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