Does culture moderate the innovation input-output relationship? A two-stage configurational analysis

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ABSTRACT

Purpose: This study analyses configurations of national culture as boundary conditions of countries' national systems of innovation (NSI). Drawing from the NSI approach, we argue that culture's role is that of a contingency factor shaping the relationship between investments in innovation and national innovation outputs.

Methodology: We assessed the moderation effect of national culture through a systematic, two-stage approach using fuzzy-set Qualitative Comparative Analysis (fsQCA), which allows the analysis of changes induced by the moderator variables. Analyses were conducted with a diverse sample of 61 countries over a period spanning 12 years, from 2011 to 2022.

Findings: Findings reveal that investments in innovation, but not individual cultural dimensions, is a necessary condition for high innovation outputs. Furthermore, several configurations of cultural dimensions were identified as moderators of the relationship between investments in innovation and innovation outputs.

Originality/Value: This study provides insights into cross-national innovation research by exposing the role of cultural configurations, rather than just individual cultural dimensions, as boundary conditions involved in the achievement of high levels of innovation.

Keywords: national culture, innovation outputs, investments in innovation, fsQCA, cross-cultural, moderation analysis.

1. Introduction

Well-developed national systems of innovation (NSI) are considered a cornerstone of countries' competitiveness and economic development (Edquist, 2019; Fagerberg and Srholec, 2008). The main tenet of the NSI approach is that innovation outputs (e.g., patents, high-tech exports, scientific publications) are the outcomes of a complex pattern of interactions between actors within national boundaries (Cirillo *et al.*, 2019; Lundvall, 2007). Innovation outputs, in conjunction with adequate policies to drive entrepreneurial activity, can spur countries' competitiveness, enhance the population's living standards, and provide competitive advantages to domestic firms, particularly in decisions about cross-cultural management (Anning-Dorson, 2019; Chen and Lin, 2021; Kim, 2023). Notwithstanding the potentiality of innovation outputs to increase countries' competitiveness and growth, the nature of the interactions among actors within a country NSI are shaped, among other factors, by societal values and beliefs; that is, by a country's culture (Hofstede, 1980; Shane, 1992).

National culture has deserved substantial attention in the field of innovation studies (Bukowski and Rudnicki, 2019; Fan *et al.*, 2017; Rinne *et al.*, 2012; Shane, 1992, 1993; Tekic and Tekic, 2021). The main rationale in this line of research is that countries with certain cultural characteristics would be more innovative, such as, for instance, countries with high individualism which tend to emphasise personal freedom and reward individual achievement (Bennett and Nikolaev, 2021). Nevertheless, contradictory findings have been observed in the literature. Shane's (1992, 1993) seminal research on Hofstede's cultural dimensions concluded that individualism and low power distance were strong drivers of national innovation rates, yet others found different cultural dimensions to be more relevant for national innovation (Bukowski and Rudnicki, 2019; Das, 2022; Murswieck *et al.*, 2020). Hofstede's (1980) individualism has been consistently linked to higher levels of innovation (Bennett and Nikolaev, 2021; Rinne *et al.*, 2012; Shane, 1992, 1993), but different types of collectivism (e.g., patriotism and nationalism) have also been linked to higher national innovation (Taylor and Wilson, 2012). In this context, configurational approaches took one step forward in identifying how cultural dimensions interact with each other to spur innovation (Fan *et al.*, 2017; Tekic and Tekic, 2021).

Despite the contribution of configurational approaches to our understanding of how culture influences national innovation, research in this field is relatively scarce (Fan *et al.*, 2017; López-Cabarcos *et al.*, 2021; Tekic and Tekic, 2021). A particularly important gap relates to the role culture has on national innovation. Even though culture has been shown to have a relationship with national innovation (Bukowski and Rudnicki, 2019; Rinne *et al.*, 2012; Shane, 1992, 1993), innovation outputs are likely to be determined by other factors, or inputs (e.g., education levels, investments in R&D, patent applications, financial markets development, quality of institutions), rather than culture alone (Lundvall, 2007). Therefore, its role is likely to be that of a boundary condition of NSI (Kalisz *et al.*, 2021; Malik *et al.*, 2021). In fact, Shane's (1993) plea for the examination of interactions between culture and other economic variables is 20 years old, and configurational research on national culture and innovation has yet to take on this view. This is stressed by Eesley *et al.* (2018), noting that prior research rarely examines why efforts to promote innovative activities result in different outcomes in different national contexts. An effort was made by Fan *et al.* (2017), who studied how configurations of cultural dimensions and institutional variables affected innovation. Nevertheless, the authors analysed combinations of cultural and institutional variables, ignoring the moderating role of cultural dimensions.

Another relevant gap follows: if culture moderates the transformation of innovation inputs into innovation outputs, then how do cultural dimensions combine to produce such moderation? National culture research has identified different culture constructs that are inherently multidimensional (Hofstede *et al.*, 2010; House *et al.*, 2004; Schwartz, 2004). In the field of innovation studies, Hofstede's model of national culture is the most disseminated construct (López-Cabarcos *et al.*, 2021; Rinne *et al.*, 2012; Shane, 1992, 1993; Taylor and

Wilson, 2012; Tekic and Tekic, 2021). Previous research was often reliant on regression-based methods to discern the moderating role of national culture (Bennett and Nikolaev, 2021; Kalisz *et al.*, 2021; Malik *et al.*, 2021), only to determine the net moderating effects of individual cultural dimensions and not combinations thereof. This is a relevant gap since Hofstede (2011) stressed that the six cultural dimensions should be understood in combination. Configurational studies, on the other hand, identified combinations of cultural dimensions, but failed to assess their moderating role (Fan *et al.*, 2017; López-Cabarcos *et al.*, 2021; Tekic and Tekic, 2021) and include all six dimensions.

This study takes on a configurational perspective on the role of national culture as a boundary condition of NSI. More precisely, we analyse the moderating role of cultural dimensions on the relationship between investments in innovation and national innovation outputs. Drawing from the literature on NSI–which states that institutional settings, infrastructures, and support activities play a key role in promoting innovation activities (Cirillo *et al.*, 2019; Edquist, 2019; Furman *et al.*, 2002; Lundvall, 2007)–we argue that culture should be considered a boundary condition affecting the way investments in innovation produce innovation outputs.

We assess the moderation effect through a systematic two-stage approach using fuzzy-set Qualitative Comparative Analysis (FsQCA) (Ma *et al.*, 2023) for two reasons. First, fsQCA allows the assessment of conjunctural causation–the effect of a single condition unfolds only in combination with other conditions (Schneider and Wagemann, 2012). Therefore, fsQCA enables understanding interactions among cultural dimensions that lead to innovation outputs. Second, the two-stage approach is a novel, systematic method to identify configurational moderation that overcomes regression-based methods limitations (Ma *et al.*, 2023). This approach is useful when moderators are multidimensional constructs (e.g., national culture), for it permits uncovering specific combinations of conditions that moderate the relationship between two variables. Furthermore, we used panel data (2011–2022) from a diverse set of 61 countries, representing over 87% of the world's GDP, of which 64% were high-income, 25% upper-middle income, and 11% lower-middle income countries. Geographically, 52% were European and neighbouring countries, 21% Asian, 18% American, and 9% African, Oceanian, and Middle-Eastern.

This study makes several significant contributions. A contribution is made to the multidisciplinary research on cross-culture and innovation studies by analysing national culture as a boundary condition of countries' NSI. On the one hand, it enriches this field of research by helping to understand the role of national culture in countries NSI and, on the other hand, it clarifies the inconsistent findings in the literature (Bukowski and Rudnicki, 2019; Rinne *et al.*, 2012; Shane, 1992, 1993). Furthermore, this study adds to the limited knowledge of configurational research on how national culture influences innovation. Previous configurational research has used a limited number of cultural dimensions (Fan *et al.*, 2017; López-Cabarcos *et al.*, 2021; Tekic and Tekic, 2021); hence, this is perhaps the first configurational study considering the interplay of all six dimensions. Since a country's culture is best determined by the interaction of all cultural dimensions (Hofstede, 2011), we offer a more precise understanding of the effects of national culture on innovation outputs. Methodologically, we use panel data to conduct analyses and apply a novel approach to study moderation in fsQCA (Ma *et al.*, 2023).

The remainder of this paper is structured as follows. After this introduction, we lay down the theoretical background and put forward our propositions. Next, we present the variables and data along with a description of the two-stage fsQCA methodology. We then present and discuss the results with several robustness analyses. Lastly, we conclude and acknowledge the limitations of the study while providing avenues for future research.

2. Literature review and propositions

The Oslo Manual (OECD/Eurostat, 2018, p. 20) defines innovation as “a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”. Even though firms are the fundamental producers of innovation, they are embedded in their country’ NSI, where the institutional setting, infrastructure, and support activities play a key role in promoting innovation activities, hence resulting in national innovation outputs (Edquist, 2006; Lundvall, 2007). Thus, we define national innovation outputs as the immediate results of NSI, in terms of the creation, diffusion, and use of knowledge, technology, and creative outputs.

One of the main tenets of NSI is that institutions shape the behaviour of organisations, constituting incentives and barriers to innovation (Edquist, 2006; Lundvall, 2007). Empirical research investigating the effects of institutions on countries' innovation has found links between the two (Boudreaux, 2017; Fan *et al.*, 2017; Tebaldi and Elmslie, 2013). Nevertheless, institutions are not the only factors affecting countries' innovation outputs. Recent research has identified several determinants of national innovation outputs, such as human capital and research efforts (Audretsch and Belitski, 2022; Audretsch and Link, 2018), infrastructural investments (Castellacci and Natera, 2013; Fagerberg and Srholec, 2008), financial markets development (Fagerberg and Srholec, 2008; Hsu *et al.*, 2014), and the sophistication of businesses (Crespo and Crespo, 2016; Maietta, 2015).

NSI theorising posits that innovation at the national level has a cumulative and path-dependent output, which arises from the combination of investments in innovation activities, both from public and private sources (Lundvall, 2007). Thus, countries with a higher investment in innovation are likely to be those where innovation outputs are more salient.

Likewise, countries where such investments are weak are likely to be lagging in terms of innovation outputs, which leads us to the following baseline proposition.

Baseline proposition: High investments in innovation are necessary for high national innovation outputs.

2.1 National culture and innovation

Culture is defined by Hofstede *et al.* (2010, p. 6) as "the collective programming of the mind that distinguishes the members of one group or category of people from others". In their latest iteration, Hofstede *et al.* (2010) described six cultural dimensions: power distance, individualism-collectivism, masculinity-femininity, uncertainty avoidance, long- vs. short-term orientation, and indulgence-restraint.

While previous research showed a relationship between culture and national innovation levels (Bukowski and Rudnicki, 2019; Rinne *et al.*, 2012; Shane, 1992, 1993), the role national culture plays in shaping countries innovation is still unclear (Efrat, 2014; Malik *et al.*, 2021; Rinne *et al.*, 2012; Tsui *et al.*, 2007). For instance, Shane's (1992, 1993) studies report culture dimensions as direct antecedents of national innovation rates, yet the author calls for an investigation into the interaction between cultural dimensions and other macroeconomic variables. Consequently, research has sprung dealing with this perspective, with Malik *et al.* (2021) study demonstrating the existence of a role of national culture other than a direct antecedent of national innovation outputs. Furthermore, Efrat (2014) found that countries with different cultures have different propensities to invest in innovation, hinting that national culture could be a boundary condition for how investments in innovation are translated into innovation outputs. In fact, Malik *et al.* (2021) reported a moderating effect of power distance, individualism, and masculinity on the relationship between national absorptive capacity and high-tech exports.

Almost two decades ago, Tsui *et al.* (2007) noted that treating cultural values as independent dimensions dominated current research, where a configurational perspective should be adopted to move the field forward. Nevertheless, recent research analysing the impact of national culture on innovation is still reliant on correlational approaches to individual dimensions of national culture (Barreto *et al.*, 2022; Bennett and Nikolaev, 2021; Gallego-Álvarez and Pucheta-Martínez, 2021; Murswieck *et al.*, 2020; Rinne *et al.*, 2012), notwithstanding a few exceptions (Fan *et al.*, 2017; Tekic and Tekic, 2021).

For instance, Fan *et al.* (2017) explored the combinations produced by cultural dimensions (power distance, individualism, masculinity, and uncertainty avoidance) and institutional variables that led to innovation in high-technology sectors. The authors adopted a configurational perspective that indicated nine different configurations of cultural and institutional variables. The study's findings highlight the equifinal paths leading to higher innovation, stressing the importance of both cultural and institutional dimensions to maintain or create leadership in innovation.

In another study, Tekic and Tekic (2021) analysed how cultural dimensions (power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation) combine to influence national innovation performance. The authors used fsQCA and identified four combinations of cultural dimensions leading to high innovation performance, which were labelled as cultural profiles. An interesting result of the study relates to individualism, which is present in three cultural profiles leading to high innovation performance but is absent in one cultural profile that reaches the same outcome (China and Hong Kong). This finding emphasizes that individualism alone, or any other cultural dimension, is insufficient for innovation and must be understood in combination with the other cultural dimensions.

Hofstede (2011) notes that cultural dimensions are only a product of our imagination and should be understood in combination. As Lytle *et al.* (1995, p. 170) put it, "culture is the integrated, complex set of interrelated and potentially interactive patterns characteristic of a group of people". Hence, the lack of consideration for the interrelations between cultural dimensions has probably led to conflicting findings in the literature. For instance, both Shane (1992, 1993) and Rinne *et al.* (2012) found that individualism and low power distance had a strong relationship with national innovation, but the effect of uncertainty avoidance was not consensual among the studies. Conversely, Gallego-Álvarez and Pucheta-Martínez (2021) found that high power distance, masculinity, uncertainty avoidance, and long-term orientation were positively related to innovation and that individualism had a negative effect. Recent research using a configurational perspective of culture has found several combinations of cultural dimensions, or cultural profiles, that lead to high innovation outputs (Fan *et al.*, 2017; Tekic and Tekic, 2021). Even though Fan *et al.* (2017) and Tekic and Tekic's (2021) works represent a step forward in understanding how different cultural profiles affect national innovation outputs, the configurational moderating effects of cultural dimensions are yet to be known. Therefore, we advance the following proposition.

Proposition 1: Configurations of national cultural dimensions exist that moderate the relationship between investments in innovation and innovation outputs.

Figure 1 shows the configurational framework developed in this study.

***** Figure 1 goes about here *****

3. Methods

This study uses fsQCA, an adequate method to deal with complex phenomena (Ragin, 2008), that has been applied to both innovation (Crespo and Crespo, 2016; Khedhaouria and

Thurik, 2017) and national culture (Fan *et al.*, 2017; Tekic and Tekic, 2021). FsQCA was developed by Ragin (2008) and it is based on set theory. As Ragin (2008) and Schneider and Wagemann (2012) note, many arguments in the social sciences can be framed in terms of relations between sets. For instance, one could argue that individualism values have a close connection to countries' innovation levels and that, consequently, almost all individualistic countries are innovative. This equates to arguing that the set of individualistic countries is mostly contained in the set of innovative countries. The fact that there are collectivistic countries that are also innovative does not directly undermine this claim, for the argument focuses on individualism by asserting that it is sufficient for innovation.

Relationships between sets can be analysed in terms of necessity and sufficiency (Ragin, 2008). A condition is considered necessary for the outcome if the set of the outcome is fully contained in the set of the condition, or, in other words, the outcome does not occur if the condition is absent (Dul, 2016). For example, an internal combustion automobile only starts (outcome) if it has adequate fuel (necessary condition). Thus, adequate fuel is a necessary condition, without which the automobile could never start. This example makes a claim of necessity, that may not be sufficient for the outcome because an automobile needs other conditions to start. In this sense, a condition is sufficient for the outcome if its set is contained in the set of the outcome. Thus, sufficient conditions analysis makes use of Boolean logic to identify combinations of conditions that are sufficient for the outcome (Ragin, 2008; Schneider and Wagemann, 2012). In our previous example, for an automobile to start it might need adequate fuel, an engine, an air intake, and a starter.

Analyses in fsQCA involve several steps after data collection, starting with the calibration of conditions. Calibration allows to define the degree of membership each case has on a given condition—fully in, fully out, and neither fully in nor fully out (Ragin, 2008). To illustrate, looking at people on a beach we can observe that some are fully submerged or swimming in the water (fully in the water), some are resting or playing in the sand (fully out of the water), and some are, to various degrees, between the water and the sand (neither fully in, nor out of the water). Fuzzy-set calibration assigns a value, between 0 and 1, to represent the degree of membership of each case in every condition, and fsQCA 3.0 software (Ragin and Davey, 2016) allows performing a direct calibration based on three anchors: full membership (1), full non-membership (0), and the point of maximum ambiguity (0.5).

The construction of the truth table follows the calibration of conditions, laying down every possible combination of conditions that can be sufficient for the outcome. This step highlights one of the tenets of causal complexity, conjunctural causation, which states that the effect of a single condition only exists in combination with other conditions (Schneider and Wagemann, 2012). In the matrix, columns represent the sets of conditions, and rows represent each possible combination between the conditions. Every single condition can be either present or absent, which makes the total number of rows equal to 2^k, where k is the number of causal conditions in the model (e.g., with four causal conditions the truth table will have 16 rows) (Schneider and Wagemann, 2012). Even though the truth table shows all logically possible combinations of conditions, not all have empirical representation (logical remainders), giving rise to a phenomenon called limited diversity (see Schneider and Wagemann [2012]). Then, cases are matched to each row according to their membership scores in each condition.

Once the truth table is constructed, two decisions must be made. First, the research has to define a frequency threshold for the relevance of causal combinations (i.e., rows). When dealing with small-n samples, a frequency threshold of 1 is considered reasonable (Ragin, 2008), but with large-n samples it would be prudent to treat low-frequency rows as those without empirical observations (that is, eliminated from the truth table), keeping at least 80% of the cases (Ragin, 2008).

The second decision involves choosing which of the remaining rows are sufficient for the outcome and which are not. FsQCA 3.0 software calculates the consistency and PRI score for each row, allowing the researcher to distinguish combinations that are subsets of the outcome from those that are not (Ragin, 2008). Ragin (2008) argues that consistency values below 0.75 indicate substantial inconsistency, so recent good practices recommend higher consistency thresholds (Greckhamer *et al.*, 2018; Pappas and Woodside, 2021). Additionally, the PRI (proportional reduction in inconsistency) score should also be observed, for it indicates if a combination of conditions is a subset of both the outcome and the absence of the outcome (Pappas and Woodside, 2021). Thus, values below 0.5 indicate significant inconsistency, and the same configuration can be simultaneously considered sufficient for the presence and the absence of the outcome (Greckhamer *et al.*, 2018). This is important because it reinforces another tenet of causal complexity, causal asymmetry, which states that combinations explaining the presence of the outcome are not necessarily the exact opposite of those explaining its absence (Schneider and Wagemann, 2012). Good practices indicate that the PRI threshold should be high and close to the consistency threshold (Pappas and Woodside, 2021).

When analysing the truth table, fsQCA 3.0 software runs the Quine-McCluskey algorithm, which logically minimises the sufficient configurations in the truth table using Boolean algebra (for a detailed explanation of the steps involved in the minimisation process, see Schneider and Wagemann's [2012] chapter 4). The standard analysis returns three solutions (Ragin, 2008): the complex solution, which makes no simplifying assumptions (i.e., assumptions that produce a more parsimonious solution); the parsimonious solution, which makes all simplifying assumptions; and the intermediate solution, which only makes some simplifying assumptions. The intermediate solution is the one that is usually analysed, because, on the one hand, the complex solution tends to be too complex to be interpreted in a meaningful way, and, on the other hand, the parsimonious solution might rest on assumptions that contradict theoretical expectations or common sense (Schneider and Wagemann, 2012). Nevertheless, parsimonious and intermediate solutions can be used simultaneously to identify which conditions of a given configuration are core and which are peripheral (Fiss, 2011).

The last step of fsQCA analysis is the interpretation. The solutions obtained can comprise multiple configurations that are sufficient for the outcome, reflecting the equifinal paths that cases follow to achieve the outcome. This highlights the third tenet of causal complexity, equifinality, which states that multiple explanations for the same phenomenon may exist (Schneider and Wagemann, 2012). Consistency and coverage scores are calculated for the overall solution, where the latter indicates how much of the outcome is covered by the obtained solution, and the former represents the strength of the relationship supported by empirical evidence (Pappas and Woodside, 2021; Schneider and Wagemann, 2012). A consistency and two coverage scores are calculated for each configuration, where consistency indicates the same as above, but for each configuration. Raw coverage indicates how much of the outcome is covered by each configuration, and unique coverage shows how much of the outcome is covered only by a specific configuration (Schneider and Wagemann, 2012). It is important to distinguish between the two coverage scores because sufficient configurations can overlap substantially, that is, one case can follow multiple paths to achieve the outcome.

In this study, we analyse the moderation role of national cultural dimensions on the relationship between investments in innovation and innovation outputs with a novel approach proposed by Ma *et al.* (2023), which is described in greater detail in section 3.6.

3.1 Data

We use panel data from the Global Innovation Index (GII), compiled by Brás (2023), spanning 12 years from 2011 to 2022. Even though the GII is not the only “scoreboard” of country-level innovation, it has several advantages compared to others. First, it includes a large number of countries, representing 98.5% of the world's GDP and 94.1% of the world's population (WIPO, 2022). Second, it differentiates innovation inputs from innovation outputs. Third, besides hard data, it also includes composite indicators and questionnaire items from the Executive Opinion Survey (World Economic Forum). Fourth, its structure has a great proximity to the elements that define NSI (Alcorta and Peres, 1998). Fifth, it is being increasingly used in NSI studies (Crespo and Crespo, 2016; González-Serrano *et al.*, 2021; Khedhaouria and Thurik, 2017; Tekic and Tekic, 2021).

National culture came from Hofstede's six cultural dimensions (Hofstede *et al.*, 2010). Although acknowledging the existence of within-country differences in culture, we use the country-level since it allows for meaningful comparisons across countries, from which policy implications could be derived. The cultural dimensions database encompasses validated cultural values for 111 countries, which, nevertheless, are absent for a large number of them.

Based on these databases, we developed a balanced panel, ranging from 2011 to 2022, where values of national culture remained constant across all years. From the intersection of both databases, we obtained a total of 61 countries in 12 years. Nevertheless, values were missing for Malta in 2011 and for Trinidad and Tobago in 2016, thus a total of 730 country-year observations were used.

3.2 Outcome condition

We used GII's innovation outputs sub-index as the outcome condition, since it reflects the results of innovative activities within the country (WIPO, 2022), and has been used in previous studies (Crespo and Crespo, 2016; Tekic and Tekic, 2021). We used the score of innovation outputs, gathered from Brás (2023), which range from 0 to 100 where higher scores mean better performances.

3.3 Antecedent condition

We measured countries' investments in innovation using GII's innovation inputs sub-index. This sub-index captures the performance of five pillars: institutions, human capital and research, infrastructure, market sophistication, and business sophistication (WIPO, 2022), which gauge countries' investment (or efforts) in innovation activities. The scores of innovation inputs, which were gathered from Brás (2023), range from 0 to 100, with higher scores meaning better performance.

3.4 Moderator conditions

We considered Hofstede's six cultural dimensions as moderator conditions. First, we used the power distance index, which is defined as the extent to which individuals in a society expect and accept that power is distributed unequally (Hofstede *et al.*, 2010). Power distance values range from 0 to 100, where higher values represent societies with higher power distance. Second, we used the individualism-collectivism dimension. In individualistic countries (e.g., Australia, USA, UK), ties between individuals are loose and one is expected to look after oneself, while in collectivistic countries (e.g., Colombia, Indonesia, Pakistan) individuals are integrated into strong, cohesive in-groups from birth onwards (Hofstede *et al.*, 2010). Values range from 0 to 100 representing a continuum where higher values indicate a more individualistic society and lower values a more collectivistic one. Third, the masculinity-femininity dimension represents the duality of the sexes. In more masculine societies (e.g., Slovakia, Japan) emotional gender roles are clearly distinct, where men are supposed to be assertive and focused on material success, and women are supposed to be modest and concerned with the quality of life. In more feminine societies (e.g., Sweden, Norway) emotional gender roles overlap and both men and women are supposed to be modest and concerned with the quality of life (Hofstede *et al.*, 2010). Values range from 0 to 100, where higher values indicate more masculine countries. Fourth, we used the uncertainty avoidance index, which refers to the extent to which individuals in a culture feel threatened by ambiguous or unknown situations (Hofstede *et al.*, 2010). Values range from 0 to 100, where higher values represent less tolerance for ambiguity and the unknown. Fifth, long- vs. short-term orientation refers to the time orientation of societies (Hofstede *et al.*, 2010). According to the six dimensions model, long-term oriented cultures foster virtues oriented towards the future, such as perseverance and thrift, while short-term oriented cultures value virtues related to the past and present, such as respect for tradition and the fulfilment of social obligations (Hofstede *et al.*, 2010). Values range from 0 to 100, where higher values indicate a more long-term oriented culture (e.g., South Korea, Japan, China) and low values a more short-term oriented one (e.g., Trinidad and Tobago, Colombia). Sixth, we used indulgence vs. restraint. More indulgent countries (e.g., Mexico, El Salvador) tend to allow free gratification of natural human desires to enjoy life and have fun, while in more restraint countries (e.g., Pakistan) there is the conviction that such gratification must be curbed and regulated by social norms (Hofstede *et al.*, 2010). Values range from 0 to 100, where higher values indicate more indulgent countries.

Table I shows the codification of conditions and their sources.

***** Table I goes about here *****

3.5 Calibration

As discussed in Section 3, conditions were calibrated by establishing the thresholds for full membership (1), full non-membership (0), and the point of maximum ambiguity (0.5) (Ragin, 2008). According to Ragin (2008) and Schneider and Wagemann (2012), values for the calibration thresholds should be based on substantive knowledge, external to the data.

However, this is not always possible since there could be no knowledge associated with cut-offs indicating membership or non-membership in a given condition, so calibration based on the sample' percentiles is the preferred method (Filippopoulos and Fotopoulos, 2022; Fiss, 2011; Khedhaouria and Thurik, 2017).

Therefore, we used the samples' percentiles method to calibrate both the GII variables and Hofstede's *et al.* (2010) cultural dimensions. This is an appropriate method for this study since, on the one hand, GII variables lack specific cut-off points, nor previous research has established them, and, on the other hand, cultural variables form a continuum with no clear definition of its poles (Hofstede *et al.*, 2010). In this sense, we used the samples'5th, 50th, and 95th percentiles as the anchors for full non-membership, cross-over point, and full membership, respectively (Table II), which are percentiles used in previous studies (Beynon *et al.*, 2016; Picoto and Pinto, 2021). Acknowledging that different percentiles could be used, we conducted robustness tests in Section 4.3 to ascertain if variations in the calibration thresholds would lead to changes in the obtained solution. Furthermore, considering that the calibration of fuzzy-sets could produce membership scores of exactly 0.5, which would be dropped in the construction of truth tables, we followed Fiss (2011) and added a constant of 0.001 to all conditions with a membership score below one.

***** Table II goes about here *****

3.6 Two-stage approach to identify moderation in fsQCA

Moderation is usually analysed using regression-based methods, namely ordinary least squares (Bennett and Nikolaev, 2021; Griffith and Rubera, 2014; Nam *et al.*, 2014), which are valid methods to assess the moderating effect of a specific variable on a relationship between two variables (Aiken and West, 1991). However, these methods do not allow an analysis of how combinations of moderator conditions affect a given relationship, nor do they allow the discovery of multiple combinations that moderate such a relationship (Ma *et al.*, 2023; Pappas and Woodside, 2021). In this context, fsQCA provides an adequate methodological framework to analyse the moderating effects of multidimensional constructs such as national culture.

Existing approaches in fsQCA to assess moderation can be described in two types (Ma *et al.*, 2023). The first approach combines regression-based methods (e.g., structural equations modelling) with fsQCA, where the moderator is mainly validated through the regression-based method and then is treated as an antecedent condition in fsQCA (Abou-Foul *et al.*, 2023; Apetrei *et al.*, 2016). The second approach separates data based on certain values of the proposed moderator, runs separate fsQCA analyses and compares the results obtained in each (Hernández-Perlines, 2016). However, several limitations exist in both approaches (Ma *et al.*, 2023). In the first approach, since both antecedent conditions and moderators are treated as antecedent conditions, changes in the former due to the inclusion of the latter are disregarded, thus it limits its explanatory power. In the second approach, a major limitation is that it does not specify which type of changes should be observed to validate a moderator since the differences in configurations could be attributed to reasons other than the proposed moderator (Ma *et al.*, 2023).

The two-stage approach proposed by Ma *et al.* (2023), as its name indicates, validates a moderator in fsQCA through two stages of analysis. In the first stage, a sufficient conditions analysis is made with only the direct antecedent conditions, resulting in a given solution. The moderating conditions are then added in the second stage and results can be compared. To identify a moderation effect in the second stage, changes in the solution should not involve the emergence or the disappearance of antecedent conditions identified in the first stage. Thus, Ma *et al.* (2023, pp. 11-12) put forth three requirements to identify moderation in configurational approaches: First, "there should be no changes in the causal factors within the causal recipe from the first to the second stage"; second, "there should be at least one moderated configuration that has change(s) of core/peripheral conditions (i.e., from core to peripheral or from peripheral to core) between the two stages"; and third, "in at least one of the moderated configurations, the moderator should be a core presence condition".

4. Results

4.1 Necessary condition analysis

In fuzzy-set analysis, a condition is considered necessary for the outcome if its consistency is greater than 0.9 (Schneider and Wagemann, 2012). Nevertheless, even though necessary, a condition may be just trivially necessary for the outcome. Therefore, Schneider and Wagemann (2012) recommend analysing the relevance of necessity (RoN), where values close to one indicate that a necessary condition is relevant for the outcome. The results of the necessary condition analysis are shown in Table III. In this study, we are interested in knowing which antecedent conditions lead to higher innovation outputs, thus we have only performed the analysis for the presence of the outcome.

***** Table III goes about here *****

Looking at Table III, we can observe that investments in innovation is a necessary and relevant condition for high innovation outputs. This gives support to our baseline proposition. These results are in line with Tekic and Tekic (2021), who found that none of the cultural dimensions is individually necessary for high innovation outputs. Even though culture is reported to have an impact on national innovation (Rinne *et al.*, 2012; Shane, 1993; Tekic and Tekic, 2021), our results suggest that this might not be a direct impact, but one where cultural dimensions condition how investments in innovation are translated into innovation outputs.

4.2 Analysis of sufficient conditions

For the analyses of sufficient conditions, two truth tables were constructed, one for each stage of the two-stage method (Ma *et al.*, 2023). In the first stage, only investments in innovation entered the model, hence a truth table with two rows was obtained, representing the presence or absence of the antecedent condition. In the second stage, the truth table included all 128 logically possible combinations of individual conditions. After the construction of the truth tables, we excluded all combinations with no empirical observation (logical remainders) by setting the frequency threshold to 12 cases (the truth table in the first stage did not go through this step). This threshold was selected for two reasons: first, since the time dimension in our data spanned 12 years, we considered it to be an appropriate minimum of cases to be representative; and second, a threshold higher than 12 would exclude more than 20% of countries (Ragin, 2008). This resulted in the exclusion of 100 rows of logical remainders (78%). Lastly, we set the threshold, in both stages, for raw consistency above 0.85, while ensuring that PRI scores were above 0.8 (Greckhamer *et al.*, 2018; Pappas and Woodside, 2021) (the second-stage truth table can be seen in Table A.I in the appendix).

When interpreting the solutions, Fiss (2011) highlights the existence of core and peripheral conditions, which are based on the causal connection with the outcome. Thus, a core condition is one for which evidence indicates a strong causal relationship with the outcome, and a peripheral condition is one for which evidence indicates a weaker relationship with the outcome. We considered that "core conditions are those that are part of both parsimonious and intermediate solutions, and peripheral conditions are those that are eliminated in the parsimonious solution and thus only appear in the intermediate solution" (Fiss, 2011, p. 403). We followed Fiss' (2011) notation in tables, where black circles ("●") indicate the presence of a condition, circles with a cross-out ("⊗") indicate its absence, blank spaces indicate a situation in which the causal condition may be either present or absent (or "don't care"), large circles indicate core conditions and small circles indicate peripheral conditions.

Table IV shows the solution obtained from the standard analysis of the model OUT = f(IN). The solution is composed of a single configuration, with a high consistency (0.87) and coverage (0.90), where IN is a core condition sufficient for high innovation outputs.

***** Table IV goes about here *****

Table V shows the solution obtained in the second stage of the analysis. Before interpreting the results, we verified that the requirements for moderation were met. Thus, it can be seen that: (1) there are no changes in the original configuration, that is, IN remains present in all configurations; (2) one moderated configuration revealed a change from core to peripheral; and (3) several cultural dimensions appear as core conditions in two configurations. Hence, it can be confirmed that cultural dimensions are valid moderators influencing the relationship between investments in innovation and innovation outputs.

***** Table V goes about here *****

The solutions obtained identified three equifinal configurations for high innovation outputs (C1-C3). Overall solution consistency is above 0.9 and ranges from 0.94 to 0.96 in individual configurations. These are all above the threshold of 0.8 (Pappas and Woodside, 2021), which indicates that identified configurations are useful in explaining countries' innovation outputs. The overall solution coverage is 0.68, suggesting that a substantial proportion of the outcome is explained by the identified solution.

Results reveal that the conjunctural causation of the six cultural dimensions moderates the interplay of investments in innovation with innovation outputs. More particularly, in C1 it can be observed that low power distance, high individualism, low uncertainty avoidance, and high indulgence are moderating cultural dimensions, where low PDI and high IVR are the most important conditions. This configuration accounts for 45% of the countries in our sample, with 23% of countries' membership in the outcome being uniquely explained by this configuration. As can be seen in Table VI, Switzerland, Finland, the Netherlands, Sweden, and the US are typical cases displaying this configuration throughout the period of analysis, while other countries possessed this configuration only in certain periods, such as Australia, Canada, Denmark, UK, Ireland, Norway, and New Zealand.

In C2, high power distance, low individualism (or collectivism), high masculinity, low uncertainty avoidance, high long-term orientation, and low indulgence (or restraint) is a moderating configuration. Typical countries with this configuration include China and Hong Kong, which explains the relatively low coverage (21%) and unique coverage (8%) of this configuration, even though it is consistently associated with high innovation outputs (0.96).

Configuration C3 reinforces the moderating role of national culture. It reveals that in countries where investments in innovation are lessened, the combination of low power distance, high individualism, high masculinity, and long-term orientation allows the achievement of high innovation outputs. This configuration accounts for 37% of the countries in our sample, with 13% of countries' membership in the outcome being uniquely explained by this configuration, including the typical cases of Switzerland, Germany, UK in all years, and Austria, Czechia, Hungary, and Italy in some years.

***** Table VI goes about here *****

4.3 Robustness tests

Following good practices in conducting research with fsQCA (Greckhamer *et al.*, 2018; Pappas and Woodside, 2021), we have performed several robustness tests. First, we tested the predictive validity of our model to see how well it predicts high innovation outputs in additional samples (Pappas and Woodside, 2021). We have divided our sample into two random subsamples: the modelling subsample and the holdout subsample. We then constructed the truth table for the modelling subsample and considered the same thresholds as in the main study. Lastly, we used the configurations found to see if they consistently predicted OUT in the holdout subsample.

Table VII shows the results of the predictive validity test. The modelling subsample revealed an overall consistency of 0.95 and an overall coverage of 0.67, which are comparable to the complete sample. Findings show that innovation outputs (OUT) in the holdout sample is accurately predicted by the configurations obtained in the modelling subsample with fairly similar consistency and coverage. Predictive validity holds when the modelling subsample is used to predict configurations obtained in the holdout subsample.

***** Table VII goes about here *****

After attesting the predictive validity of our model, we conducted robustness tests by varying calibration, consistency, and frequency thresholds (Greckhamer *et al.*, 2018). To calibrate conditions, we used the 1^{st} (fully out), 50^{th} (cross-over point), and 99^{th} (fully in) percentiles for one analysis, and the 10^{th} (fully out), 50^{th} (cross-over point), and 90^{th} (fully in) percentiles for another. We varied consistency thresholds in the truth tables as follows: raw/PRI consistencies of 0.95/0.85 for one analysis and 0.85/0.75 for another. Lastly, we varied the frequency threshold to 11 cases in one analysis and 10 cases in another.

Table VIII summarises the results of each robustness analysis. We can observe that more stringent changes led to a reduction in the number of configurations, while with more relaxed thresholds the number of configurations increases. Changing the frequency threshold did not change the solution obtained. Only by assuming a calibration with the $1^{st}/50^{th}/99^{th}$ percentiles did the solution include one more configuration. Overall, consistency and coverage values remain within accepted levels and comparable to those of the main study.

***** Table VIII goes about here *****

5. Discussion

The purpose of this study was to analyse the moderating role of cultural dimensions' configurations on the relationship between investments in innovation and national innovation outputs.

Results support our two propositions, providing evidence to help close the identified gaps. First, results support the moderating role of cultural dimensions affecting how investments in innovation are transformed into innovation outputs, reinforced by the fact that investments in innovation was considered a necessary condition for innovation outputs. This lines up with previous research that found culture to interact with other factors in promoting national innovation (Bennett and Nikolaev, 2021; Malik *et al.*, 2021). The centrality of countries' innovation efforts evidences a boundary condition role of national culture, signifying that regardless of the cultural configuration, innovation outputs will not occur if investments are not made. These findings are in line with NSI theory, which posits that innovation has a cumulative and path-dependent output, arising from the combination of investments in innovation activities (Lundvall, 2007). Thus, investments in innovation have a central role in driving countries' innovation levels, which leads to the second gap: if culture moderates the transformation of innovation inputs into innovation outputs, then how do cultural dimensions combine to produce such moderation?

Following a novel and systematic approach to test configurational moderation, we identified national culture configurations that moderate the relationship between investments in innovation and innovation outputs. More particularly, our results reveal that in countries with low power distance, high individualism and masculinity, and a long-term orientation, even though investments in innovation lose importance, this cultural configuration supports high innovation outputs. Previous research viewing national culture as a boundary condition, though using regression-based methods, attested to the independent moderating role of several cultural dimensions, such as power distance, individualism, and masculinity (Malik *et al.*, 2021).

Notwithstanding their low moderating effect, C1 and C2 show contrasting cultural profiles. While C1 reflects a more Westerner cultural profile–represented by developed English-speaking countries, Nordic countries, Switzerland, and the Netherlands–that value the absence of power distance and high indulgence the most, C2 indicates an Eastern cultural profile, represented by China and Hong Kong, where high masculinity and absence of indulgence are the most important cultural dimensions for national innovation outputs. Interestingly, the absence of uncertainty avoidance is shared in these two cultural profiles, supporting Shane's (1993) findings. The equifinality found in our results shows that innovation is not a trait specific to a given culture, but an ability shared by countries in supra-national cultural zones (Ronen and Shenkar, 2013).

Our results address Shane's (1993) plea to investigate interactions between culture and other economic variables. Specifically, we uncovered how configurations of national culture interact with the efforts made by countries to promote innovation.

6. Conclusion

This paper presents one of the first studies of national culture as a boundary condition of NSI that takes a configurational approach. Overall, it highlights the necessity of investments in innovation to achieve high innovation outputs and the moderation role of certain configurations of national cultural dimensions. This research adds to cross-culture and innovation studies by presenting evidence of a moderating role of national cultural dimensions on NSI using a configurational approach.

Some implications can be drawn from our results. First, results revealed patterns of cultural profiles more closely linked to high levels of innovation. For managers of multinational enterprises, supra-national cultural zones have been suggested to affect the liability of foreignness more than individual countries' culture (Beugelsdijk *et al.*, 2017). When deciding about new international ventures, whether investment or collaborations, managers should be aware that the costs of doing business abroad could potentially be higher outside their supra-national cultural zone. Even though the perspective of culture not being determined by national boundaries has been recognized in international business literature (Beugelsdijk *et al.*, 2017; Ronen and Shenkar, 2013), cross-cultural innovation scholars should be aware that cultural profiles may not be unique to specific countries, but shared within a geographically defined region. Thus, international business managers could use the results of our study to engage in some form of cultural arbitrage, that is, exploit differentials in countries' cultures (Denrell *et al.*, 2003). An example of cultural arbitrage comes from Shi and Hoskisson (2012), who describe that US startups in South Korea employ local female talent in leadership positions that domestic Korean firms tend to overlook, hence generating diverse teams that translate into commercial advantages.

Second, from a public policymaking perspective, our results highlight the need for investments in innovation to be made. Being one of the most important conditions to achieve high innovation outputs, and the only considered necessary for that outcome, policymakers should direct their attention to fostering innovation activities within their economies, such as, for instance, the development of sound institutional settings, technological infrastructures, IP regulation or support firm-level innovation (Bennett and Nikolaev, 2021; Furman *et al.*, 2002). Also, cultural arbitrage is a potentially innovative way to promote countries' distinctive cultural traits, particularly among countries outside their supra-national cultural zone.

6.1 Limitations and future research

This study has some limitations worth noting, for they can become the basis for future research. First, we used Hofstede's framework of national culture, which is not free of criticism (Ailon, 2008). Nevertheless, the validity of Hofstede's cultural dimensions has been demonstrated multiple times (Tekic and Tekic, 2021; Tung and Stahl, 2018), and researchers might find value in reproducing our results with different frameworks of national culture, such as the GLOBE study (House *et al.*, 2004) or the World Values Survey (WVS, Inglehart et al., 2014).

Second, owing to Hofstede's measures having a cross-sectional nature, we are prevented from making causality claims regarding national culture. Yet, the WVS framework (Inglehart *et al.*, 2014) conducts continuous waves of surveys across nations, which could provide important insights into the interplay of investments in innovation and national culture (Beugelsdijk and Welzel, 2018). Given the changing global context, it would be valuable for future research to incorporate a more thorough examination of the dynamic nature of cultural factors' impact on innovation. Thus, adopting a cultural change perspective (Inglehart and Baker, 2000) could allow us to attain deeper insights into how national culture influences countries' innovation levels.

Third, our study identified national culture as a boundary condition of NSI. Previous research found conflicting effects of cultural dimensions on both the inputs and the outputs of innovation (Tian et al., 2021). Thus, even though we identified cultural configurations–or cultural profiles–that moderate the innovation input-output relationship, it would be beneficial to conduct a more detailed investigation into the diversity of cultural dimensions across countries and different supra-national cultural zones.

Fourth, we used a novel, systematic method to assess configurational moderation–a two-stage fsQCA approach (Ma *et al.*, 2023). Even though this is a recent methodology, the two-stage approach overcomes a major limitation of existing moderation assessment techniques (e.g., ordinary least squares, structural equation modelling): the explicit modelling of interactions among the moderator dimensions. Nevertheless, given its newness, the two-stage approach to configurational moderation must be subjected to extensive experimentation and application in future research–a step made by this study. Other steps could be exploring different moderating conditions, such as cultural diversity or institutional quality (Bennett and Nikolaev, 2021; Zhan *et al.*, 2015).

Overall, this study highlights the need to consider the interplay of culture and investments in innovation in explaining countries' innovation outputs. Our results suggested that no individual cultural dimension is necessary for high innovation outputs, whereby combinations thereof were identified as boundary conditions of NSI. The use of a configurational approach allowed the observation of the configurations of national culture, or cultural profiles, that serve as boundary conditions. Hence, this study could help in directing researchers' attention beyond individual cultural dimensions to cultural profiles and assess their conditional effects on national innovation processes or other cross-cultural phenomena in business management.

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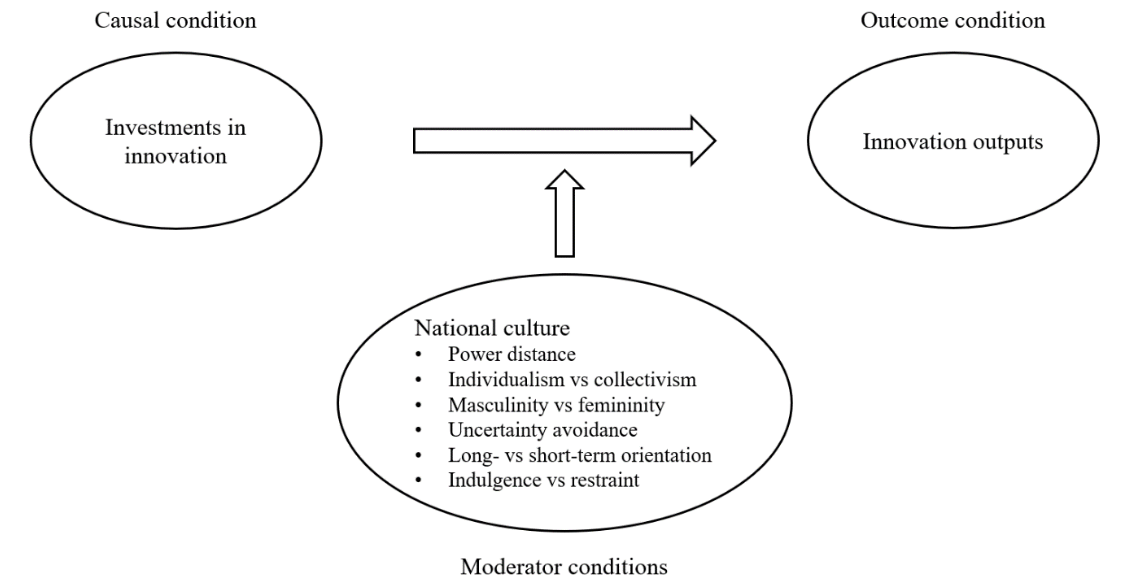
Figure 1 – Configurational framework



Source: Authors.

Table I - Conditions' codification and sources

Indicator	Condition	Source
Innovation outputs	OUT	(Brás, 2023)
Innovation inputs	IN	(Brás, 2023)
Power distance	PDI	(Hofstede et al. (2010); geerthofstede.com)
Individualism	IDV	(Hofstede et al. (2010); geerthofstede.com)
Masculinity	MAS	(Hofstede et al. (2010); geerthofstede.com)
Uncertainty avoidance	UAI	(Hofstede et al. (2010); geerthofstede.com)
Long-term orientation	LTO	(Hofstede et al. (2010); geerthofstede.com)
Indulgence	IVR	(Hofstede et al. (2010); geerthofstede.com)

Source: Authors.

Table II - Descriptive statistics and calibration thresholds

	OUT	IN	PDI	IDV	MAS	UAI	LTO	IVR
Descriptive statistics								
Mean	37.1	51.3	58.0	47.1	48.8	66.1	49.4	46.8
Standard deviation	11.5	11.4	20.2	23.1	19.7	22.7	21.9	21.4
Minimum	9.5	23.7	11.0	13.0	5.0	8.0	12.6	0.0
Maximum	68.6	74.9	100.0	91.0	100.0	100.0	100.0	97.3
Calibration criteria								
Full membership (95%)	55.8	68.6	93.0	80.0	79.0	96.0	82.9	80.1
Cross-over point (50%)	36.5	50.2	60.0	46.0	50.0	68.0	48.6	46.2
Full non-membership (5%)	19.3	33.4	28.0	16.0	14.0	29.0	14.1	15.8

Source: Authors.

Table III - Necessary condition analysis

	OUT		
Conditions	Consistency	Coverage	RoN
IN	0.900	0.870	0,877
~IN	0.410	0.425	0,651
PDI	0.498	0.527	0,702
~PDI	0.792	0.751	0,783
IND	0.773	0.783	0,825
~IND	0.470	0.465	0,646
MAS	0.661	0.655	0,740
~MAS	0.633	0.639	0,738
UAI	0.568	0.546	0,669
~UAI	0.666	0.696	0,781
LTO	0.744	0.737	0,788
~LTO	0.535	0.541	0,690
IVR	0.679	0.683	0,761
~IVR	0.587	0.584	0,705

Note. ~ indicates de absence of a condition. Source: Authors.

Table IV - Sufficient condition analysis

OUT	C1
IN	●
Consistency	0.870
Raw coverage	0.900
Unique coverage	0.900
Solution consistency	0.870
Solution coverage	0.900

Black circles indicate the presence of a condition, and circles with "⊗" indicate its absence. Large circles indicate core conditions and small ones, peripheral conditions. Blank spaces indicate "don't care" conditions. Source: Authors.

Table V - Moderating influences of national culture

OUT	C1	C2	C3
IN	●	●	•
PDI	⊗	•	⊗
IDV	•	⊗	•
MAS		●	•
UAI	⊗	⊗	
LTO		•	•
IVR	●	⊗	
Consistency	0.942	0.961	0.948
Raw coverage	0.451	0.210	0.371
Unique coverage	0.226	0.079	0.134
Solution consistency	0.948		
Solution coverage	0.676		

Black circles indicate the presence of a condition, and circles with "⊗" indicate its absence. Large circles indicate core conditions and small ones, peripheral conditions. Blank spaces indicate "don't care" conditions. Source: Authors.

Table VI - Typical cases for each configuration

Recipe	Typical cases
C1	AU14, AU15 CA11, CA12, CA13, CA15 CH11, CH12, CH13, CH14, CH15, CH16, CH17, CH18, CH19, CH20, CH21, CH22 DK12, DK13 FI11, FI12, FI13, FI14, FI15, FI16, FI17, FI18, FI19, FI20, FI21, FI22 GB12, GB13, GB14, GB15, GB16, GB17, GB18, GB19, GB20, GB21, GB22 IE12, IE13, IE14, IE15, IE16, IE17, IE18, IE19 NL11, NL12, NL13, NL14, NL15, NL16, NL17, NL18, NL19, NL20, NL21, NL22 NO11, NO12, NO13, NO14, NO15, NO16, NO17 NZ11, NZ12, NZ13, NZ14, NZ15, NZ16 SE11, SE12, SE13, SE14, SE15, SE16, SE17, SE18, SE19, SE20, SE21, SE22 US11, US12, US13, US14, US15, US16, US17, US18, US19, US20, US21, US22
C2	CN16, CN17, CN18, CN19, CN20, CN21, CN22 HK11, HK12, HK13, HK14, HK15, HK16, HK18, HK19, HK20, HK21
C3	AT11, AT12, AT13, AT14, AT15, AT16, AT17 CH11, CH12, CH13, CH14, CH15, CH16, CH17, CH18, CH19, CH20, CH21, CH22 CZ11, CZ12, CZ13, CZ14, CZ15, CZ16, CZ17, CZ18, CZ19, CZ20, CZ21 DE11, DE12, DE13, DE14, DE15, DE16, DE17, DE18, DE19, DE20, DE21, DE22 GB11, GB12, GB13, GB14, GB15, GB16, GB17, GB18, GB19, GB20, GB21, GB22 HU11, HU12, HU19 IT13, IT14, IT20

AT: Austria. AU: Australia. CA: Canada. CH: Switzerland. CN: China. CZ: Czech Republic. DE: Germany. DK: Denmark. FI: Finland. GB: United Kingdom. HK: Hong Kong. HU: Hungary. IE: Ireland. IT: Italy. NL: Netherlands. NO: Norway. NZ: New Zealand. SE: Sweden. US: USA. Source: Authors.

Table VII - Predictive validity testing

Modelling sample (n = 365)			
OUT	**C1**	**C2**	**C3**
IN	●	●	●
PDI	⊗	⊗	●
IDV	●	●	⊗
MAS		●	●
UAI	⊗		⊗
LTO		●	●
IVR	●		⊗
Consistency	0.941	0.967	0.956
Raw coverage	0.459	0.352	0.215
Unique coverage	0.245	0.126	0.082
Solution consistency	0.946		
Solution coverage	0.679		
Holdout sample (n = 365)			
Consistency	0.944	0.969	0.967
Coverage	0.443	0.388	0.205
Overall consistency	0.950		
Overall coverage	0.673		

Black circles indicate the presence of a condition, and circles with "⊗" indicate its absence. Blank spaces indicate "don't care" conditions. Source: Authors.

Table VIII - Summary of robustness tests

Change in thresholds	**Changes in solution**	**Consistency**	**Coverage**
Raw/PRI consistency (0.90/0.85)	Two configurations appear: One is C2. The other is IN*~PDI*IDV*~MAS*~UAI*IVR.	0.970	0.511
Raw/PRI consistency (0.80/0.75)	Five configurations appear: The three original configurations remain. The other two are IN*~PDI*IDV*~UAI*LTO and IN*PDI*IDV*UAI*LTO*IVR	0.942	0.732
Frequency threshold (11)	No changes	0.948	0.676
Frequency threshold (10)	No changes	0.948	0.676
Calibration (P1, P50, P99)	Four configurations appear: The three original configurations remain. The new one is IN*PDI*IDV*UAI*LTO*IVR	0.959	0.715
Calibration (P10, P50, P90)	No changes	0.945	0.652

Source: Authors.

APPENDIX

Table A.I - Truth table for the moderating influences of national culture

Line	IN	PDI	IDV	MAS	UAI	LTO	IVR	OUT	raw consistency	PRI consistency	Country-year
1	1	0	1	1	0	1	0	1	0,974	0,872	DE11-22
2	1	0	1	0	0	1	1	1	0,973	0,923	NL11-22, SE11-22
3	1	0	1	1	0	1	1	1	0,971	0,912	CH11-22, GB11-22
4	1	0	1	1	1	1	1	1	0,966	0,876	AT11-22, LU11-22
5	1	0	1	0	0	0	1	1	0,964	0,907	DK11-22, FI11-22, NO11-22
6	1	0	1	1	1	1	0	1	0,964	0,858	CZ11-21, IT12-21, JP11-22, HU11,12,19,21
7	1	1	0	1	0	1	0	1	0,961	0,836	HK11-22, CN16-22
8	1	1	0	0	0	1	0	0	0,959	0,745	SG11-22
9	1	1	1	1	1	1	1	0	0,958	0,776	BE11-22
10	1	1	1	0	1	1	1	0	0,956	0,778	FR11-22
11	1	0	1	0	0	1	0	0	0,945	0,781	EE11-22, LV12,13,15,17-19, LT12,16-19
12	1	0	1	0	1	0	0	0	0,943	0,666	ES11-22
13	1	0	1	1	0	0	1	1	0,929	0,824	AU11-22, CA11-22, IE11-22, NZ11-22, US11-22
14	1	1	0	0	1	1	1	0	0,923	0,479	SI11-22
15	0	0	1	0	0	1	0	0	0,913	0,494	LV11,14,16,20-22, LT11,13-15,20-22
16	1	1	0	0	1	1	0	0	0,909	0,526	KR11-22
17	0	1	1	1	0	1	0	0	0,887	0,262	IN11-22, SK11-22
18	0	0	1	1	1	0	1	0	0,845	0,245	AR11-22
19	0	0	0	1	1	1	0	0	0,832	0,200	PK11-22
20	0	0	1	1	0	0	1	0	0,815	0,135	ZA11-22
21	0	1	1	1	1	0	0	0	0,805	0,090	MA11-22, PL11-16,18,20-22
22	0	0	0	0	0	0	0	0	0,754	0,096	IR11-22
23	0	1	0	0	0	1	0	0	0,748	0,109	ID11-22, VN11-22

24	0	1	0	0	1	1	0	0	0,711	0,113	BG11-22, HR11-22, RO11-22, RU11-22, RS11-22
25	0	1	0	0	0	0	0	0	0,704	0,049	TH11-22
26	0	1	0	1	0	0	0	0	0,663	0,037	BD11-22, PH11-22
27	0	1	0	0	1	0	1	0	0,647	0,068	BR11-22, CL11-22, SV11-22, PE11-22, TR11-22, UY11-22
28	0	1	0	1	1	0	1	0	0,640	0,052	CO11-22, MX11-22, GR11-18,20-22

AR: Argentina. AT: Austria. AU: Australia. BD: Bangladesh. BE: Belgium. BG: Bulgaria. BR: Brazil. CA: Canada. CH: Switzerland. CL: Chile. CN: China. CO: Colombia. CZ: Czech Republic. DE: Germany. DK: Denmark. EE. Estonia. ES: Spain. FI: Finland. FR: France. GB: United Kingdom. GR: Greece. HK: Hong Kong. HR: Croatia. HU: Hungary. ID: Indonesia. IE: Ireland. IN: India. IR: Iran. IT: Italy. JP: Japan. KR: South Korea. LT: Lithuania. LV: Latvia. LU: Luxembourg. MA: Morocco. MX: Mexico. NL: Netherlands. NO: Norway. NZ: New Zealand. PE: Peru. PH: Philippines. PK: Pakistan. PL: Poland. RO: Romania. RS: Serbia. RU: Russia. SE: Sweden. SG: Singapore. SI: Slovenia. SK: Slovakia. SV: El Salvador. TH: Thailand. TR: Türkiye. US: USA. UY: Uruguay. VN: Viet Nam. ZA: South Africa. Source: Authors.