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Exploring processes in Spanish, German and UK boards: a measurement framework of board know-how, board diversity and directors' interactions interrelation

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Keywords:	Board processes, Measurement, Partial Least Squares, board know-how, board diversity, social interactions

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3 **Exploring processes in Spanish, German and UK boards: a measurement**
4 **framework of board know-how, board diversity and directors' interactions**
5 **interrelation**
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12 **Abstract**
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14 **Purpose** – Several empirical attempts have investigated boardroom processes and their
15 impact on the governing team decision-making. Such attempts, however, have derived in
16 inchoate results opening new methodological debates and leaving the underlying patterns
17 of board processes obscure. This paper aims to shed light on these patterns by empirically
18 examining the interrelation among the three central constructs involved in board decision-
19 making: know-how, demographic diversity, and directors' social interactions.
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28 **Design/methodology/approach** – A framework of interrelation among know-how,
29 demographic diversity and social interactions was conceptually built and empirically
30 validated with Partial Least Squares Structural Equation Modeling applied to archival
31 data from a sample of 87 boards of directors of Spanish, German and UK listed
32 companies.
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40 **Findings** – Results unmask the intricacies of behavioral processes involved in know-
41 how-demography relation: demographic diversity contribution to know-how is totally and
42 positively mediated by directors' social interactions. This reveals the power of directors'
43 socialization frequency in determining processes and predicting know-how.
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49 **Practical implications** – The paper offers a new pathway to manage board know-how
50 and to make board diversity effective. It also opens a door to an innovative empirical
51 methodology to make board processes emerge, one that overcomes methodological
52 limitations of previous efforts.
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3 **Originality/value** – This is so far the only study that examines and measures holistically
4 the structural interrelation among the three central constructs determining board decisions
5 and performance: know-how, diversity and social interactions.
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10 **Key Words** – Board processes, Measurement, Partial Least Squares, Board know-how,
11 Board diversity, social interactions
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14 **Paper type** - Research paper
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17 18 19 **Introduction**

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21 Since corporate governance literature started considering boards of directors'
22 performance as a relevant research field, research has been focusing mainly on how
23 formal incentives and control mechanisms to protect shareholders' interests determine
24 board behaviour and its relationship with company performance (van Ees *et al.*, 2009).
25 The predominance of this agency theory-based approach has led to profuse but frequently
26 inconclusive results (Huse, 2018 pp. 11-12; Westphal and Zajac, 2013), encouraging
27 scholars from a variety of disciplines to claim the centrality of board processes in board
28 performance research.
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Board process studies adopt a micro level management perspective to explain how
the demographic diversity of the governing team impacts its decision-making and
functioning through a number of intervening behavioral processes (Daily *et al.*, 2003;
Forbes and Milliken, 1999; Francoeur *et al.*, 2018; Hoppmann *et al.*, 2019; Huse, 2018 p.
9; Pugliese *et al.*, 2015; Pye and Pettigrew, 2005; Roberts *et al.*, 2005; Steckler and Clark,
2019; van Ees *et al.*, 2009; Westphal and Zajac, 2013). Despite the agreed conceptual
assumption that processes explain decisions, numerous scholars have been reluctant about
the actual need of measuring the deep intricacies of board processes (Huse, 2018) and
“how and why outcomes are differentially shaped by processes” (Pye and Pettigrew,

2005). Adhering to the parsimony argument that knowledge and behavioral dynamics can be inferred from board demographics (Forbes and Milliken, 1999), they have utilised performance outcomes to measure the quality of decisions, and board processes to theoretically build the discursive arguments explaining it. Strongly influenced by Cyert' and March's Behavioral Theory of the Firm and Blair' and Stout's Team Production Theory (Barroso-Castro *et al.*, 2017), and encouraged by Forbes' and Milliken's seminal model of board processes (Forbes and Milliken, 1999), these studies have put their argumentative focus on know-how – as named in this paper – i.e. on the usage of board knowledge under the behavioral processes in which directors build or destroy emotional, cognitive, and social ties, share information, discuss, and negotiate to eventually reach collective decisions. The debate has been long open and the parsimony argument is still present in numerous studies on board performance, but with persistent inchoate results claiming that the diversity-decision relation is “affected by mediating variables/processes” (Sharda, 2019) that require further examination.

A second methodological debate around the type of data adds to the list of difficulties to penetrate into the core of board processes (Huse, 2018 p.16). Archival data do not reach the deepest patterns of directors' behavior. Although primary data allow information “to be gathered as close to action and context as possible” (Pye and Pettigrew, 2005), they are not easy to access, nor always interpreted in a reliable way (Huse, 2018 p.16). As a result, quantitative studies on board processes demand more reliability and more validity (Forbes and Milliken, 1999; Huse *et al.*, 2011).

In order to shed light on these debates, this study aims at empirically examining the underlying structural relation among board know-how, board demographic diversity and directors' social interactions. It applies the Partial Least Square-Structural Equation Modeling (PLS-SEM) technique to archival data from 87 boards across 3 countries –

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3 Spain, Germany and the UK. The PLS-SEM technique helps capture and measure the
4
5 deep structural interrelation among complex constructs like those involved in board
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7 decision-making. Processing archival data, the paper contributes to methodological
8
9 advancement in board processes measurement, reconciling the need to reach their deepest
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11 patterns with problems of primary data methodologies.
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15 The paper offers an instrument for both practitioners and regulators to weight and
16
17 prioritize the plethora of different and disassociated norms and practices on board
18
19 composition and on board activities that have an impact on board know-how. This should
20
21 help enhance the board decision making.
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25 Next section presents the conceptual foundations of an interrelation framework of
26
27 board know-how, board diversity, and directors' social interactions. Section 3 discusses
28
29 the methodological problems faced by previous studies on board processes. Section 4
30
31 empirically validates the framework through the measurement of each construct
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33 formation and of their interrelationship. Last section outlines conclusions and the main
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35 managerial, research and regulations contributions, and presents limitations and future
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37 research endeavours.
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42 **Conceptual background**

43 *Know-how*

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46 When examining Forbes' and Milliken's (1999) model of board processes, one may
47
48 be invited to see board decisions as a coin with an hidden side – processes – and a
49
50 perceptible side – board and firm performance. By sequentially setting that (1) what
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52 directors individually invest in terms of knowledge, skills, and demographic traits (2)
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54 collectively produces specific board processes to (3) result in performance outputs, their
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3 model also invites to conceive that know-how – as defined above – links stages two and
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5 three as a result of processes that give birth to all decisions made in the boardroom.
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8 Anchored in this view of board know-how role, this paper argues that know-how
9
10 cannot be inferred from board demographics, and that it will emerge from directors' social
11
12 interactions. To sum up, the paper conceptualises know-how as the decisional construct
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14 fed by demographic diversity and other individual skills embedded in the knowledge on
15
16 the board tasks domain, and resulting from directors' social interactions that produce
17
18 specific behavioral processes. Consequently, the paper argues that if know-how can be
19
20 measured, then it becomes the best proxy for all board processes involved in decision-
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22 making, and an excellent predictor of the quality of decisions made.
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29 **Directors' provision of knowledge on the board tasks domain.** Directors acquire
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31 knowledge on the board task domain through their own educational background, through
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33 their own experience as directors in other companies, and through specific training
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35 provided by the company. There may be other marginal ways for directors to increase
36
37 their knowledge on the board task domain, but they are informal – normally founded on
38
39 their own networking – thus not accredited and difficult to assess.
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43 Previous studies show that directors' higher education background in business and
44
45 economics enhances their knowledge on the task domain, and provides higher creativity
46
47 and abilities to learn and find solutions (Wang *et al.*, 2017). It also brings the essential
48
49 expert knowledge for every kind of industry (Allemand *et al.*, 2017; Forbes and Milliken,
50
51 1999).
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54 Expertise on the board tasks domain is provided by non-executive members holding
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56 several directorships at a time. Because these directors often work or have worked as
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58 executives in other companies, their experience gives them an important understanding
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3 of the executive team's problems, and much common but also diverse knowledge of
4 corporate and industrial processes. Due to their other mandates, non-executive directors
5 also have wide networks that ease the access to information and other external resources
6 (Baccouche *et al.*, 2014; Carpenter and Westphal, 2001; O'Higgins, 2002). However,
7 multiple directorships also produce too much workload and busyness (Bergman Brown
8 *et al.*, 2019).

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17 Finally, training programs increase directors' skills in the board tasks domain
18 (Chiang and He, 2010) and help directors better understand and apprehend their roles and
19 responsibilities in the board (Bernstein *et al.*, 2015; Brown *et al.*, 2012). Training is also
20 important to develop group decision-making skills, to foster ethical behaviour and
21 whistleblowing in case of manipulation of a board member, and to make members feel
22 more confident and more legitimated to voice their own stances (Maharaj, 2008).

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33 **Directors' interactions.** Fostering social interactions is the essential facilitator of
34 board internal processes (Daily *et al.*, 2003; Francoeur *et al.*, 2018; Huse, 2005; Pugliese
35 *et al.*, 2015; Roberts *et al.*, 2005; Steckler and Clark, 2019). Directors' interactions imply
36 exchanges and communication that may improve or worsen the quality of decisions,
37 generate or destroy knowledge and resources within the board (Barroso-Castro *et al.*,
38 2017; Forbes and Miliken, 1999; Francoeur *et al.*, 2018; van Ees *et al.*, 2009). The scarce
39 specific research on directors' time spent together has highlighted three main scenarios
40 to foster directors' exchanges: board meetings, informal social events, and induction
41 programs (Baccouche *et al.*, 2014; Berman *et al.*, 2002; Du and Xu, 2018; Forbes and
42 Milliken, 1999; Geletkanycz and Hambrick, 1997; Grassi *et al.*, 2016; Gray and Nowland,
43 2018; Piekkari *et al.*, 2015; Roberts *et al.*, 2005; Schwizer *et al.*, 2011; Vafeas, 1999; van
44 Woerkom and Sanders, 2010). There exists significant research on board meetings, but it
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3 has normally taken them as proxies of board activity instead of proxies of interactions
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5 frequency. Despite the centrality of directors' interactions to board know-how, very little
6
7 is known about how directors meet, socialize, and communicate, and how these
8
9 exchanges interfere in the know-how-diversity relation.
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14 *Demographic diversity*

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16 Numerous studies have determined that demographic diversity – gender, age and
17
18 ethnicity – affects board decisions and performance, and have proposed a number of
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20 processual arguments to justify it.
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26 **Gender.** Women have higher levels of board meeting attendance and preparation
27
28 than men. They incite men attend more meetings and improve meeting preparation,
29
30 resulting in less social loafing (Huse, 2018:49; Torchia *et al.*, 2018). Compared to men,
31
32 women deploy higher emotional intelligence and have more inclination to ethical
33
34 behaviours and equality perceptions (Bart and McQueen, 2013; Nielsen and Huse, 2010).
35
36 They think more critically and voice opposing opinions on managers' decisions; they
37
38 bring creativity into board discussions and share more information (Elstad and Ladegard,
39
40 2012; Kim and Starks, 2016; Mathisen *et al.*, 2013; Tejedo-Romero *et al.*, 2017).
41
42 However, feeling perceived as equal board members (Nielsen and Huse, 2010), and
43
44 feeling part of a “big-enough” minority group (Torchia *et al.*, 2011) are key drivers to all
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46 these positive impacts.
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53 **Age.** Old directors hold a more cautious attitude towards business, risk and wealth,
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55 producing less integration and more emotional conflict (Talavera *et al.*, 2018). However,
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57 they positively complement younger generations. They have much experience – many
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3 have served as CEOs –, and wisdom helping them become good strategy advisors
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5 (Ferrero-Ferrero *et al.*, 2015; Goergen *et al.*, 2015).
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10 **Ethnicity.** Foreign directors increase decisional alternatives considered, and are
11 more likely to cooperate (Milliken and Martins, 1996; Ruigrok *et al.*, 2007). At the same
12 time, they may feel inhibited in their minority position (Ruigrok *et al.*, 2007) or minority
13 language (Piekkari *et al.*, 2015), being more likely to miss formal board meetings (Min
14 and Chizema, 2018).
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24 The divergent arguments about how diversity produces know-how-creative or
25 know-how-destructive processes reveal that board demographic contribution to
26 decisions is subdued to the nature of directors' interactions (Harrison and Klein, 2007).
27 Diversity may be experienced as distance towards the dissimilar others, leading to
28 emotional conflict, distrust, competition, deviance and less cohesion. Or it may be
29 experienced as richness of cognitive frames, experiences, expertise, networks, values,
30 skills, activeness, and socialization attitudes, that, combined, produce cognitive conflict,
31 creativity and openness, and widen the comprehension capacity of group members
32 (Blanco-Oliver *et al.*, 2018).
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46 Researchers have considered another type of individual contribution to the board,
47 stemming from deep-level individual characteristics such as personality, beliefs, values
48 and attitudes, and also affecting board decisions (Huse *et al.*, 2009; Walker *et al.*, 2015;
49 Zona *et al.*, 2013). Even if the boundaries between surface-level demographics and other
50 deep-level traits are clear in concept, they have been both treated as 'diversity' while the
51 extent to which each one brings diversity stimuli to board processes is vague, and one
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3 dependant on the other (Huse *et al.*, 2009). A reason why this paper defines surface-level
4 and deep-level diversity as different constructs in respect to their contribution to board
5 know-how, and argues that deep diversity should be held in each director's know-how
6 contribution and thus contained in the resulting know-how construct.
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16 Figure 1 offers a convenient representation of the relationships explained in this
17 section.
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30 **Going beyond the determinants-performance logic**

31 As shown in Tables I and II, most empirical attempts to approach board processes
32 rest on a determinants-performance logic, with very little exceptions such as Elstad' and
33 Ladegard's work (Elstad and Ladegard, 2012). These attempts have worked to directly
34 measure and weight the effect of board observable traits on company and board
35 performance outputs used as proxies of the quality of board processes and decision-
36 making. However, this logic does not reach to capture the underlying cognitions and
37 patterns of behaviour forming the process (Brown *et al.*, 2012; Carpenter and Westphal,
38 2001).
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50 Furthermore, the determinants-performance logic has fostered the emergence of a
51 plethora of different determinants and performance outputs, often studied individually,
52 causing relevant consensual gaps on their role on board decisions (Carpenter and
53 Westphal, 2001; O'Higgins, 2002), and excluding from measurement actually affecting
54 determinants (Baccouche *et al.*, 2014; Geletkanycz and Hambrick, 1997). The logic
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3 offers, then, a limited vision of board processes whose understanding requires a more
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5 holistic explanation (Pettigrew, 1992).
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8 Finally, the determinants-performance logic embeds endogeneity that needs to be
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10 quantitatively addressed but also conceptually as it implies that the meaning of the
11
12 direction of the relationship requires further clarification (Allemand *et al.*, 2017; Tan *et*
13
14 *al.*, 2020).
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17 The measurement logic of the proposed framework remains fully on the
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19 “determinants” part of the determinants-performance equation. Putting the focus on board
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21 know-how as the central decisional construct, the framework eliminates any board or
22
23 company performance measurement. Following Forbes and Milliken (1999), it relies on
24
25 the idea that knowing about board know-how will make more effective and accurate a
26
27 posterior analysis of the demography-performance relationship. The framework connects
28
29 *simultaneously* and *directly* know-how, diversity and directors’ social interactions, and
30
31 involves *collectively* the major construct determinants to measure their formation.
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37 << Insert Table I here >>

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39 << Insert Table II here >>
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44 **The challenge of ‘good’ data**

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46 Processual studies face a major difficulty: detecting actual drivers of behaviour.
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48 They normally address it by introducing process-oriented data obtained from
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50 questionnaires (Baumeister *et al.*, 2007). In the context of board behaviour,
51
52 questionnaires allow the collection of directors’ and top managers’ perceptions and
53
54 assessments on directors’ role, efficiency, and involvement, and on board tasks
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56 performance and group dynamics. Self-reporting and self-valuation of one’s or one’s
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3 team behaviour make these data reliance be questioned. Factors that drive behaviour are
4
5 often invisible to the people performing it. Also, discrepancies between real attitudes and
6
7 reports of past behaviours, or hypothetical future ones, cause inaccuracies in the
8
9 information provided by respondents (Baumeister *et al.*, 2007; Bernstein *et al.*, 2015;
10
11 Brown *et al.*, 2012). When respondents are CEOs or chairmen, reliance problems become
12
13 more serious since they tend to “be more lenient, less variable, more biased and show less
14
15 agreement with the judgment of others” (Carcio, 2004).
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19 Furthermore, survey-based studies introduce problems derived from both non-
20
21 response bias, and common method bias (Brown *et al.*, 2012; Geletkanycz and Hambrick,
22
23 1997; Huse *et al.*, 2011; Nielsen and Huse, 2010). They also hold problems related to
24
25 constructs measurement, concretely to the construct validation and to the scale
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27 development stages (Payne *et al.*, 2003). The ability of survey-based research to advance
28
29 theoretical knowledge is highly dependent on the degree to which the measures they use
30
31 capture the essence of the constructs they are intended to represent (Bedford and Speklé,
32
33 2018).
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37 Certainly, researchers have tried to overcome these obstacles by introducing other
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39 methodologies such as interviews, dyadic analysis or direct behavioural observations
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41 (Huse, 2005). However, they increase costs, difficulty and time, and introduce data that
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43 for some authors are unethical, infeasible and even impossible (Huse *et al.*, 2011;
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45 Baumeister *et al.*, 2007).
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49 Finally, the access to board members and the information they hold is often
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51 obstructed (Daily *et al.* 2003; Geletkanycz and Hambrick, 1997). Directors are normally
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53 highly exposed in their professional life but unaccustomed to be exposed to assessments
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55 and personal development questions (Schmidt and Brauer, 2006) which makes it difficult
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57 to reach them.
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3 Methodological drawbacks of primary data-based studies explain the
4 predominance of archival data-based works (see Tables I and II). Archival data are more
5 and more accessible and used in exploratory research to suggest causal relationships in
6 contexts with scarcity of clearly defined theory like the board processes context (Hair *et*
7 *al.*, 2019). Board observable data are “parsimonious representations of constructs that are
8 otherwise difficult to collect and validate” (Westphal and Zajac, 1995). They reveal the
9 surface of boards and directors, one that can be easily apprehended thus managed and
10 regulated in codes and laws. Because their fine and interrelated effects on board processes
11 make them ineffective individual indicators of board performance (Barroso-Castro *et al.*,
12 2017; Westphal and Zajac, 1995), they should not be examined in isolation. This paper
13 argues that processing archival data collectively and with the appropriate technique such
14 as PLS-SEM is effective for estimating complex models – like the paper framework – to
15 provide causal explanations to the proposed relationships.
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35 **Methods**

36 *Sample selection*

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38 This study took place in the European context offering the chance to elect countries
39 representing significantly different systems of corporate governance, but as homogeneous
40 as possible according to their economic and social situations. Among the five strongest
41 European economies according to their GDP, United Kingdom represents the “Classic
42 Shareholder-oriented model”, Germany the “Stakeholder-oriented Consensus model”,
43 and Spain the “Mixed Market Economies model” hybrid system (Haxhi and Aguilera,
44 2017).
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3 Companies considered were those listed in the main stock index of each of the
4 selected countries (FTSE-100, DAX-30, and IBEX-35) at December 31ST, 2012. Two
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6
7 people completed a previously designed table. Finally, a unique data set was created.
8
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10 As the size of the Spanish index is the smallest, and full information could only be
11 available for 29 companies of this index, that same number was considered in the German
12 and UK cases, electing companies in an alphabetical order, and including only companies
13 from which complete information could be collected. The final sample was formed by 87
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17 boards and their 1.399 directors. A good general overview of the final sample can be seen
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20 on the basis of the average values of all variables of the study (Table III).
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26 <<insert Table III here>>
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30 *Measures*

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32 As derived from the theoretical framework, determinants (variables) cause
33 constructs – not reflect them. They define different aspects of the construct, and are not
34 interchangeable. For these reasons, the framework constructs – know-how, diversity and
35 directors' social interactions – were measured with their corresponding variables in a
36 formative way (Andreev et al., 2009).
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44 All variables were measured with archival data retrieved from corporate annual
45 reports, web pages, and corporate governance reports at a closing date of December 31ST,
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48 2012 (Table IV). All board members, with no distinction among different types of
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51 directors, have been considered in the measure of variables.
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53 Three variables ranging latently along conitnuums – training, induction, and social
54 events – were measured with a dichotomous scale. Although compared to longer scales,
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57 this measurement approach limits the depth of information collected, the scarce details
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3 disclosed by companies and the lack of previous validated scales for these variables
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5 forced such decision.
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10 << Insert Table IV here >>
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14 Additionally three control variables were introduced: board size (number of board
15 members), company main industry (dummy variable), and country of the company stock
16 trade market (dummy variable).
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23 *Data analysis*

24 Data were processed with the PLS-SEM technique (Smart PLS software, version
25 3.2.8). PLS-SEM was chosen because it provides enough flexibility for a productive
26 dialogue between theory and data that ends up finding what is hidden behind data. This
27 makes PLS-SEM appropriate for exploratory research with secondary data and complex
28 models of formative constructs, variables and structural interrelations (paths) like the one
29 of this study (Hair *et al.*, 2019). PLS-SEM emphasizes prediction over confirmation,
30 overcoming the debate around explaining – as prioritized in academia – and predicting –
31 as aimed by practitioners (Hair *et al.*, 2019). PLS-SEM reveals possible mediations and
32 moderations that regression models – paradigms of the determinants-performance logic
33 – are not capable of capturing (Tenenhaus *et al.*, 2005).
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49 PLS-SEM estimates separately and subsequently the variables-construct
50 relationships (called measurement model) and the constructs interrelation (called
51 structural model) by using separate ordinary least squares regressions (Hair *et al.*, 2019).
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54 In the first step, construct values are iteratively estimated based on their determinants
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(variables), and the reliability and validity of the measurement is verified. In the second step, path coefficients between constructs are calculated as part of the structural model.

The estimation through PLS-SEM includes a final stage of bootstrapping for inference testing. In the study, both the bootstrapping procedure with 5000 re-samples and the percentile bootstrap, at the 95% confidence interval, were run. The model was evaluated using path coefficients, R2 of endogenous variables, and the standardized root mean square residual (SRMR) (Henseler *et al.*, 2014).

Findings

Validity and reliability of the measurement model

External validity was not assessed because no alternative measures for any of the study constructs through reflective variables were found. Because the model is formative, internal consistency and convergent validity were not applicable validation measures. Instead, multicollinearity was tested with the Variance Inflation Factor (VIF) technique resulting in values well below the cut-off value of 3, and confirming that multicollinearity did not pose a threat to the validity of the constructs formation measurement. Finally, all determinants' weights were significant indicating that they explained a significant portion of the variance in each construct (Hair *et al.*, 2019). Correlations between each pair of constructs were all lower than 0.7, evidencing the discriminant validity of the model (Henseler *et al.*, 2015) (see Table V).

<<insert Table V here>>

Structural model and mediation analysis

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3 The estimation of the structural model (Table VI) resulted in a non-significant direct
4 effect of diversity on know-how explained by the mediating effect generated by social
5 interactions (Figure 2). In the absence of the social interactions construct, diversity has a
6 significant total effect on know-how. This suggests that the influence of diversity on
7 know-how is fully exerted through directors' social interactions.
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17 << Insert Table VI here >>
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26 To test this mediating effect (Table VII), the indirect effect significance between
27 diversity and know-how constructs was analysed, resulting to be statistically significant
28 at a 95% confidence level. Additionally, the importance of the indirect effect was studied
29 through the Variance Accounted For (VAF) that achieved a value of 0.934, confirming
30 that the diversity-know-how relationship is totally mediated by social interactions
31 Including social interactions in the model, makes R^2 increase substantially reflecting the
32 importance of this variable to explain know-how formation. In the three-constructs model
33 the SRMR is 0.067 (lower than 0.080), indicating an overall adequate model fit (Henseler
34 *et al.*, 2015).
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54 Finally, the effects of the control variables board size and industry, on know-how
55 were not significant. Furthermore, in order to find out possible significant differences in
56 the model estimated for each considered country of the sample, the research also included
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3 a moderation study based on interaction effects on the diversity → know-how and social
4 interactions → know-how relationships. Results revealed that the moderation effect is not
5 significant in neither of the two relationships (Table VIII).
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17 **Conclusion, limitations and future research**

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19 In accordance with what Forbes and Milliken (1999) claimed two decades ago, this
20 study findings confirm that the demography-decision relation requires a middle step
21 analysis in which empirical attention is paid to boardroom behavioral processes. And this
22 for different reasons. First, findings show that the quality of board decisions can be
23 anticipated without calling on outcomes of performance. The resulting validated
24 framework provides a way to directly measure the impact of board demographics on
25 board processes held in know-how, the central processual construct capable to explain
26 “how and why outcomes are differentially shaped by processes” (Pye and Pettigrew,
27 2005). The paper findings demonstrate that investigating exclusively on the base of
28 performance outputs prevents the emergence of actual distortions on the found
29 relationships.
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44 Second, findings reveal that the direct relation between board demographic
45 diversity and board decisions embeds the action of the frequency of directors interactions,
46 that is, of the facilitator of board processes. This is extremely relevant for the
47 understanding and management of the diversity-know-how relation that fully depends
48 upon how much directors are able to communicate and exchange their knowledge and
49 skills. This should guide regulators and practitioners, particularly in what refers to the
50 diverse composition of the board that to date seems to be working as a box-ticking list
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3 (Main and Gregory-Smith, 2018). The framework could then be beneficial to policy
4 makers to issue more structurally interrelated recommendations aiming at changing board
5 behaviour, not only its outlook that, by itself, does not guarantee a better know-how.
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10 Third, the cross-country analysis shows no differences, revealing the relevance of
11 the individual level analysis of board processes in the understanding of board
12 performance.
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17 Regarding the methodological debate, results support the increasing power of
18 archival data to measure complex social constructs (Hair *et al.*, 2019). The quantitative
19 validation of the framework meets the need to reinforce the scarce research on board
20 dynamics measurement (Huse, 2005; Torchia *et al.*, 2018). Despite the inherent
21 limitations of archival data to proxy board processes (Barroso-Castro *et al.*, 2017; Forbes
22 and Milliken, 1999), this study shows that utilising different indicators in a simultaneous
23 and collective way, it is possible to measure, in a consistent and valid way, underlying
24 behavioural patterns of board processes using observable data. Results also show the need
25 to change the research logic. Future studies could dare to exploit archival data in
26 measurement techniques that allow them approach complex behavioral constructs.
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28 Further connection with performance indicators will be an imperative to them to create a
29 complete view of decisions: their determinants and their outputs.
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47 The present research holds some major limitations: the absence of “temporal
48 interconnectedness” (Pettigrew, 1992) among constructs; the need to open up the measure
49 of constructs complexity – particularly in the case of know-how – to other determinants
50 such as deep-level directors’ traits, or the level of education, the education specialization,
51 and the duration of education. Future research could explore the validation of the
52 framework with a sample of directors constrained to specific types, i.e. only non-
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executives, and the validation and the evolution of the framework measures over time an
in other contexts, countries. All in all, this study provides a starting point for innovative
future examination and prediction of boards decisions.

Team Performance Management

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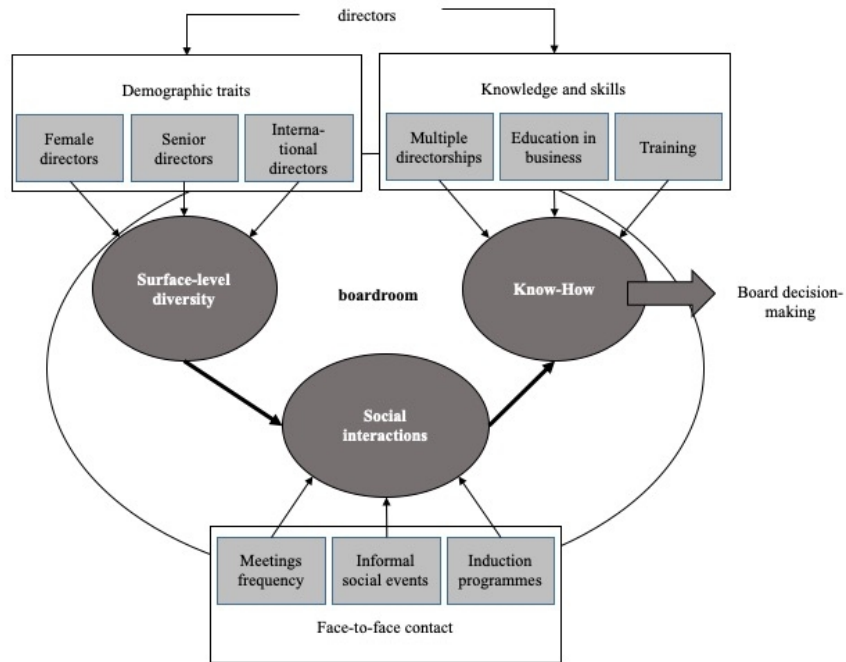


Figure 1. The framework of board know-how, board diversity and directors' interactions relationship

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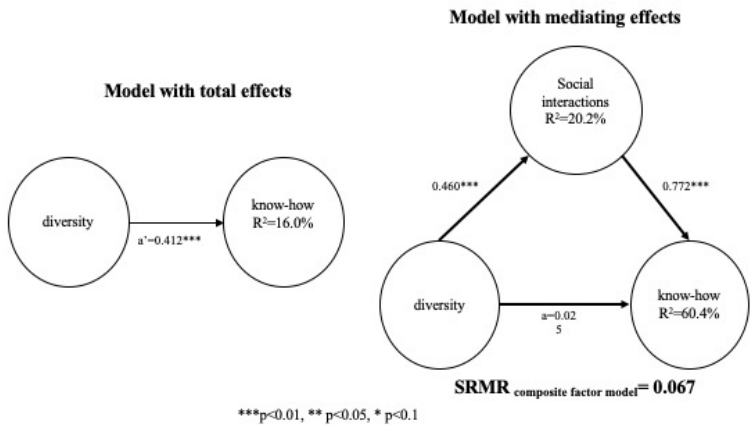


Figure 2. Structural model
254x190mm (72 x 72 DPI)

Construct quality proxies	Data and methods	Construct	Construct determinants	Supporting literature
<p>Company performance:</p> <ul style="list-style-type: none"> - Financial and risk rates - Financial and risk strategies - innovation/R&D strategies - M&A strategies - Corporate ownership - Propensity to commit fraud - strategic choice measured by strategic conformity <p>Board practices:</p> <ul style="list-style-type: none"> - directors and CEO compensation - disclosure - meetings attendance & frequency - board diversity (outsiders, expertise, foreign non-executives) - intellectual capital index - training - evaluation - succession planning 	<p>Archival data, internal reports, board minutes</p> <p>Regression, ANOVA analysis</p>	Know-how	Multiple directorships of non-executives	<p>Allemand <i>et al.</i>, 2017 Baccouche <i>et al.</i>, 2014 Brown <i>et al.</i>, 2019 Hernandez-Lara and Gonzales-Bustos, 2019 Mazzola <i>et al.</i>, 2016 Tan <i>et al.</i>, 2020</p>
			Directors' higher education in economics and business-related studies	<p>Allemand <i>et al.</i>, 2017 D'Amato and Gallo, 2019 Papadimitri <i>et al.</i>, 2020 Tan <i>et al.</i>, 2020 Wang <i>et al.</i>, 2017</p>
		Diversity	Female directors	<p>Badru <i>et al.</i>, 2019 Bauxali-Soler <i>et al.</i>, 2016 Böhren and Staubo, 2016 Cambrea <i>et al.</i>, 2019 Kim and Starks, 2016 Tejedo-Romero <i>et al.</i>, 2017 Torchia <i>et al.</i>, 2018</p>
			Senior directors	<p>Ferrero-Ferrero <i>et al.</i>, 2015 Goergen <i>et al.</i>, 2015 Talavera <i>et al.</i>, 2018</p>
			International directors	<p>Min and Chizema, 2018 Ruigrok <i>et al.</i>, 2007</p>
		Directors' social interactions	Board meetings frequency	<p>AlHares <i>et al.</i>, 2018 Chen <i>et al.</i>, 2006 Gray and Nowland, 2018 Ji <i>et al.</i>, 2019</p>
			Informal social events	<p>Geletkanycz and Hambrick, 1997</p>

Construct quality proxies	Data and methods	Construct	Construct determinants	Supporting literature
<p>Perceptions on directors' and board performance:</p> <ul style="list-style-type: none"> - ability to contribute to board discussions and board tasks - characteristics of effective non-executive directors - own confidence - involvement in board tasks - type of reasoning - board conflict - justice - cohesion - organizational innovation - self-censorship - information and knowledge sharing - social interaction - quality of board meetings discussions - solidarity behaviours 	<p>Questionnaires, defining issues tests, interviews, panels</p> <p>Regression, ANOVA analysis, content analysis, case studies, short case scenarios,</p>	Know-how	Multiple directorships of non-executives	Carpenter and Westphal, 2001 O'Higgins, 2002
			Training programmes for directors	Bernstein <i>et al.</i> , 2015 Brown <i>et al.</i> , 2012
		Diversity	Female directors	Bart and McQueen, 2013 Elstad and Ladegard, 2012 Kanadli <i>et al.</i> , 2018 Mathisen <i>et al.</i> , 2013 Nielsen and Huse, 2010
			International directors	Piekkari <i>et al.</i> , 2015
		Directors' social interactions	Informal social events	Berman <i>et al.</i> , 2002 Sanders and Van Emmerik, 2004 van Woerkom and Sanders, 2010
			Induction programmes	Schwizer <i>et al.</i> , 2011

	All countries	United Kingdom	Germany	Spain
Industry (Global Industry Classification Standard 2020)				
Industrials	17.2%	13.8%	6.9%	31.0%
Financials	17.2%	20.7%	17.2%	13.8%
Materials	14.9%	17.2%	20.7%	6.9%
Consumer Discretionary	1.6%	13.8%	13.8%	10.3%
IT	9.2%	10.3%	10.3%	6.9%
Health Care	8.0%	3.4%	17.2%	3.4%
Utilities	5.7%	-	6.9%	10.3%
Energy	5.7%	10.3%	-	6.9%
Consumer Staples	5.7%	6.9%	3.4%	6.9%
Telecommunications Services	3.4%	3.4%	3.4%	3.4%
Board size	14.9%	11.7%	23.1%	13.8%
Multiple directorships of non-executives	56.6%	74.4%	48.6%	46.7%
Directors' education in economics and business	61%	72.3%	43%	67.7%
Training programmes for directors (MODE)	YES	YES	NO	YES
Female directors	15.2%	17.5%	14.9%	13.2%
Directors older than 60	33.8%	36.4%	25%	39.9%
International directors	22.4%	29%	19.6%	18.7%
Board meetings per year	9.1	9.7	7.3	10.2
Informal social events (MODE)	NO	NO	NO	NO
Induction programmes (MODE)	YES	YES	NO	YES

Construct	Variable	Measure
know-how	Multiple directorships of non-executives	Percentage of non-executive board members with 1 or more directorships in other listed companies of the same stock exchange
	Director education in economics and business-related studies	Percentage of board members with education in fields of business & economics (International Standard Classification of Education - ISCED 2011 (UNESCO,2012))
	Training programs for directors	1 if formal year-round programs exist 0 Other cases
diversity	Female directors	Percentage of female directors
	Director age: senior directors	Percentage of directors older than 60
	International directors	Percentage of foreign-to stock exchange country directors
social interactions	Board meetings	Number of board meetings per director held in the year (In the case of Germany, only supervisory board meetings)
	Informal social events	1 if the board organized (and disclosed) informal social events for directors in the year 0 Other cases
	Induction programs	1 if year-round programs exist 0 Other cases

ance Management

Construct	Variable	VIF	Weight		Constructs correlations
know-how	Multiple directorships of non-executives	1.078	0.219	**	
	Director education in economics and business-related studies	1.176	0.531	***	
	Training programs for directors	1.095	0.630	***	
diversity	Female directors	1.055	0.774	***	Know-how: 0.397
	Director age: senior directors	1.164	0.384	*	
	International directors	1.261	0.573	***	
social interactions	Board meetings	1.233	0.208	**	Know-how: 0.684
	Informal social events	1.027	0.268	***	
	Induction programs	1.261	0.812	***	Diversity: 0.460

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Management

Effects on endogenous variables	Direct effects (path coefficient)	t-value (bootstrap)	Percentile 95% confidence intervals	Explained variance (%)
social interactions (R ² adjust= 0.202)				
↑ diversity	0.460	5.468 ***	[0.306; 0.637]	Sig. 21.6
know-how (R ² adjust= 0.604)				
↑ diversity	0.025	0.28	[-0.152; 0.188]	No Sig. 1.0
↑ social interactions	0.772	13.384 ***	[0.656; 0.880]	Sig. 52.8

*** $p < 0.01$

Team Performance Management

Total effects of diversity on know-how		Direct effects of diversity on know-how		Indirect effects of diversity on know-how via social interactions		
Coef. 0.412	t-value 3.231 ***	Coef. 0.025	t-value 0.28	Point estimate 0.355	Percentile bootstrap 95% confidence interval [0.248; 0.504] Sig	VAF (%) 0.934

*** $p < 0.01$

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Effects on endogenous variables	Direct effects (path coefficient)	t-value (bootstrap)	Percentile 95% confidence intervals		
social interactions (R ² adjust= 0.202)					
↑ diversity	0.459	5.463	***	[0.304; 0.634]	Sig.
know-how (R ² adjust= 0.593)					
↑ diversity	0.030	0.320		[-0.166; 0.205]	No Sig.
↑ social interactions	0.714	10.132	***	[0.574; 0.852]	Sig.
↑ country	0.098	1.276		[-0.048; 0.254]	No Sig.
↑ country*diversity	0.045	0.599	***	[-0.115; 0.184]	No Sig.
↑ country*social interactions	-0.095	1,315		[-0.222; 0.061]	No Sig.

*** $p < 0.01$