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Uncertainty in decision-making: A review of the international business literature

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Abstract: Uncertainty is a key contextual factor that affects the decision-making of multinational corporations on many types of international operation. However, the variety of ways in which uncertainty has been defined and studied in the international business literature, has contributed to a fragmented view of MNC behavior and of the role of uncertainty in international decision-making. Adopting a broad view of uncertainty, and by means of a systematic review, this paper examines the treatment of uncertainty in international decision-making in the IB literature and identifies directions for future research. The review organizes studies across 13 dimensions of uncertainty and eight approaches to managing it. The paper further identifies five characteristics of individual decision-makers that have been shown to impact their perceptions of uncertainty and their choice of uncertainty management approach. Based on this systematic review, the paper makes three main critical observations about existing research: inconsistency in the conceptualization and measurement of uncertainty, lack of diversity regarding the dimensions of uncertainty included in single studies, and downplaying the role of individual decision-makers. A research agenda is presented that offers suggestions on how future research might address these limitations.

Sniazhana Sniazhko

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PUBLIC INTEREST STATEMENT

How do international companies make decisions about their international expansion, participation strategies, and their level of control and commitment when future returns are uncertain? This paper summarizes what we know about this complicated phenomenon of uncertainty by discussing 13 different dimensions of uncertainty that companies are likely to face during international decision-making, and presenting eight approaches for how to manage these uncertainties. The paper also identifies five characteristics of individual decision-makers in the companies that have been shown to impact their perceptions of uncertainty and their choices of uncertainty management approach. Lack of clear distinctions among different dimensions of uncertainty may result in misleading perceptions of the real environment and subsequently to risky and unjustified decisions. A better, research-based understanding about uncertainty and its management is important in increasing the chances of a company's survival in the international business environment.

Subjects: Risk Management; Strategic Management; International Business

Keywords: uncertainty; decision-making; MNC; systematic review

1. Introduction

Uncertainty and its role in decision-making is an important phenomenon that has received considerable research attention within international business (IB) studies over the last five decades. Uncertainty, defined as the lack of knowledge about the probabilities of the future state of events (Knight, 1921), has been shown to affect multinational corporations' (MNCs) speed of international expansion, their internationalization paths, entry mode choices, and level of commitment (e.g., Aharoni, 1966; Aharoni, Tihanyi, & Connelly, 2011; Ahsan & Musteen, 2011; Johanson & Vahlne, 1977; Liesch, Welch, & Buckley, 2011). The inability of a decision-maker to eliminate uncertainty completely constrains the effectiveness of decision-making and requires the adoption of approaches that either help to reduce, or to cope with, uncertainty. Recent studies commonly differentiate between exogenous and endogenous uncertainties, as well as environmental, industry, and firm uncertainties. They also advocate the diligent management of uncertainty to improve the chances of MNCs surviving in the international business environment (Certo, Connelly, & Tihanyi, 2008).

Although uncertainty has been incorporated into many studies on decision-making within MNCs, the IB literature lacks clear distinctions between different dimensions of uncertainty and often treats the concept inconsistently. Research distinguishes between environmental and firm uncertainties, yet the dimensions used to capture such uncertainties vary significantly among studies. This inconsistency is problematic because it provides conflicting results about MNCs' decision-making under uncertainty, impedes knowledge development and a systematic treatment of uncertainty, and presents an incomplete picture of the role uncertainty plays in international decision-making. In terms of practice, the lack of clear distinctions among different dimensions of uncertainty may result in misleading perceptions of the real environment and subsequently to risky and unjustified decisions (Brouthers, 1995).

In light of the above, this paper offers an in-depth analysis of what is known about uncertainty in the IB literature. Accordingly, it first aims to provide insights into the ways in which uncertainty is treated and managed in decision-making in the theoretical and empirical IB literature, and further, to address the uncertainty treatment issues in international decision-making arising in the articles reviewed. Overall, this paper seeks to offer a comprehensive overview of existing knowledge on uncertainty in the IB literature, and to suggest areas for future research. In doing so, the paper contributes to the literature on decision-making in IB in the following three ways. First, it addresses the inconsistent conceptualization and measurement of uncertainty by organizing and synthesizing the dimensions of uncertainty into an integrative framework that should be useful to scholars in this field. Second, the paper presents arguments for why being more consistent in the use of concepts and measures of uncertainty, using a wider spectrum of different kinds of uncertainties, and integrating the characteristics of the key individual decision-makers, would advance the field and add significantly to the predictive validity of theoretical models. This serves to highlight key issues that should be considered when deciding how and why to incorporate different dimensions of uncertainty into empirical studies on MNC decision-making. Finally, the paper contributes to the IB literature by proposing an agenda for future research on decision-making under uncertainty. More specifically, the agenda provides suggestions for how the field could benefit from studies that include (1) dimensions of uncertainty that are more conceptually and statistically parsimonious and the greater use of subjective measures of uncertainty; (2) a wider spectrum of uncertainties, in particular firm dimensions of uncertainty, within single studies; and (3) the role of individual decision-makers in how different dimensions of uncertainty are perceived and managed within the MNC. This paper complements existing reviews on similar topics (e.g., Ahsan & Musteen, 2011; Shepherd & Rudd, 2014) by providing a more detailed categorization of uncertainty and an extended critical review of uncertainty management in international decision-making, thus making the review of broader value to scholars in different management disciplines.

2. Method

The current research adopts the systematic literature review method, which offers an explicit, trustworthy, and reproducible method to minimize bias, thus providing more reliable findings for the evaluation and interpretation of previous research relevant to a particular theme of interest (Alderson, Green, & Higgins, 2004). Since this paper integrates a framework-led approach to the synthesis of the literature, the practices recommended by Denyer and Tranfield (2009) for conducting a systematic literature review are most relevant. These practices have been designed particularly for management and organization studies and have been used by other scholars to conduct systematic literature reviews in the business field (e.g., Ellwood, Grimshaw, & Pandza, 2016). Denyer and Tranfield (2009) develop four key principles that should be evident within a systematic literature review: transparency and inclusivity, and it should also be explanatory and heuristic. In terms of *transparency*, this paper explicitly describes the processes and methods employed in the review[1]. To demonstrate *inclusivity* and the quality of information sources, this paper places emphasis on the reviewed articles' reported methods of data collection and analysis, with detailed information on uncertainty measures. This paper aims to provide an *explanation* of conflicting extracts from individual studies and to integrate them into a holistic view on the treatment of uncertainty in IB studies. The result of this review is *heuristic* in the sense that it offers suggestions that may help in addressing the mixed findings regarding the impact of uncertainty on MNC decision-making.

2.1. Literature search

To ensure the rigor of this review, the author consulted an information specialist in the field of business studies, who assisted in the process of identifying relevant keywords, and searching select databases with the chosen keywords. The following keywords were used to locate relevant articles: (uncertainty OR complexity OR ambiguity OR risk OR dynamism OR "high-velocity" OR instability OR equivocality) AND ("decision-making" OR decisions OR decision) AND ("international business" OR "international businesses" OR "multinational enterprise" OR "multinational enterprises" OR "multinational corporation" OR "multinational corporations"). Using these keywords, searches were conducted in the EBSCO, ABI Inform ProQuest, Elsevier Science Direct, and Emerald databases. These databases are recognized as the key sources for retrieving relevant, up-to-date, and historical information in the business field, and are commonly used by other scholars to conduct either systematic (e.g., Ellwood et al., 2016) or other kinds of literature reviews (e.g., Radaelli & Sitton-Kent, 2016). The preliminary searches within the databases using the above-mentioned keywords identified 495,753 articles.

2.2. Selection process

The two fundamental steps in a systematic literature review are (i) deciding on the inclusion and exclusion criteria of studies, and (ii) assessing the quality of the studies to be included (Briner & Walshe, 2015). The preliminary extensive list of identified articles was narrowed down to specifically relevant theoretical, conceptual, or empirical articles that focus on uncertainty in international decision-making by applying the following three main inclusion criteria. *First*, in order to be included, articles must be peer-reviewed studies published in scientific journals with the publication time period 1921[2]–2017, and ranked at levels 3, 4, or 4* according to the Academic Journal Guide (ABS, 2015). Earlier reviews suggest relying on top peer-reviewed academic journals because such journals are the most influential on the IB field (Hennart & Slangen, 2015), as gatekeepers of quality research (e.g., Vaara & Whittington, 2012), and are particularly influential in research on uncertainty (e.g., Miller, 1992), providing explicit information on the various definitions of uncertainty and/or its measurements. By applying the first inclusion criterion, the search generated a long list of 4,861 articles.

Second, the articles included in the review should have an explicit focus on the impact of uncertainty (or its synonyms)[3] on MNCs' international strategic (e.g., decisions about foreign direct investment and related strategies, entry mode choices, and foreign partners and market selection), and operational decisions (e.g., product development, staffing, inter-firm trade). Reading the titles

of the articles and removing duplicates from the list reduced the number of articles to 581. Most of the excluded articles related to non-management topics (e.g., technical or engineering articles, articles with mathematical models, or articles in neuroscience). The abstracts of the 581 remaining articles were read, which resulted in a total of 278 articles being deemed relevant for the review. The articles that were left out focused on other units of analysis (e.g., focus on the country) rather than on MNCs.

The *third* and final inclusion criterion was that articles should either look at the impact of uncertainty on MNCs' international decision-making, or examine the kind of uncertainty management methods used. This criterion is applied to examine how the recognized uncertainties shape MNCs' decision-making under uncertainty and how MNCs respond to these uncertainties. Articles that met all three inclusion criteria were considered for the review, producing a final total of 114 articles (18 conceptual; two theoretical; and 94 empirical, of which 84 were quantitative, six were qualitative, two used mixed methods, and two a simulation model). All the articles provide an explicit definition of uncertainty (or its synonyms) in terms of its dimensions (i.e., environmental, industry, or firm uncertainties).

Among the 114 articles reviewed, seven of the conceptual articles do not define uncertainty in terms of its dimensions and describe uncertainty as a general term for an MNC's lack of information about its external market. Further, these articles do not provide any measures of uncertainty. However, even though the inclusion criterion was not fully met for these articles, they were still included due to their rich description and discussion of relevant concepts, and detailed reviews of the role of uncertainty in MNCs' decision-making. Empirical papers that did not present an explicit definition of uncertainty dimensions and/or its measures were excluded from the review since the lack of an explicit description of uncertainty measures in an empirical article brings into question the contribution of the research.

Furthermore, not all articles among the selected 114 elaborate on MNCs' uncertainty management methods. A group of 18 papers (four conceptual, one theoretical, and 13 empirical) did not provide an explicit examination of uncertainty management methods, but still became part of the review because they either offered detailed measures of uncertainty dimensions or incorporated different theoretical perspectives offering diverse views on the impact of uncertainty on MNCs' decision-making. Finally, this systematic review is not exhaustive in the sense that studies that are published in book format, in other journals, or in languages other than English were excluded. A summary of the selection process and exclusion criteria is presented in Table 1.

The selected 114 articles are distributed among the following 23 journals (number of articles per journal in parentheses): *Academy of Management Journal* (4), *Academy of Management Review* (1), *Administrative Science Quarterly* (1), *British Journal of Management* (2), *Business Horizons* (1), *Columbia Journal of World Business* (1), *Decision Sciences* (1), *European Journal of Marketing* (3), *International Marketing Review* (7), *International Business Review* (18), *International Journal of Operations and Production Management* (1), *Journal of Business Research* (5), *Journal of International Business Studies* (25), *Journal of International Management* (7), *Journal of Management Studies* (5), *Journal of Management* (2), *Journal of Marketing Research* (1), *Journal of World Business* (13), *Long Range Planning* (1), *Management International Review* (5), *Management Science* (1), *Organizational Science* (4), and *Strategic Management Journal* (5).

2.3. Analysis of selected articles

To maintain consistency with Denyer and Tranfield's (2009) systematic review practices, analysis proceeded through three main phases. Owing to the heterogeneity of the selected articles' theoretical frameworks and empirical methods, the analysis was descriptive in nature. First, the articles were analyzed in terms of the number and type of uncertainties addressed (i.e., the terms that were used and defined in the article), to compile a comprehensive list of different uncertainties that receive the most attention. Articles were labeled with as many types of uncertainties as

Table 1. Summary of the article selection process

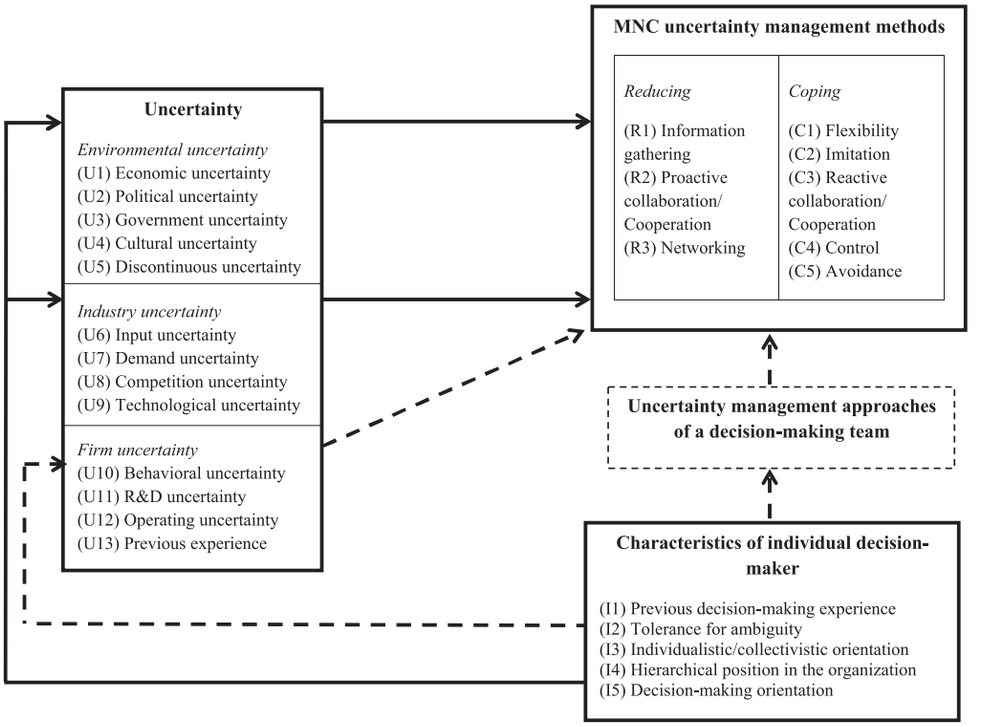
Method	Inclusion/exclusion criteria	Number of articles remaining
Keywords search in databases	Exhaustive list of articles	4861
Reading of article's title	Does the article address the main subject of the review? The following articles were excluded: • Technical or engineering articles • Articles in the area of psychology or neuroscience • Articles related to finance/banking • Articles on mathematical models	581
Reading of abstract	Does the article focus on uncertainty and its impact on MNCs' international decision-making? The following articles were excluded: • Articles focusing on uncertainty/risk in terms of capital budgeting procedures or cost of capital formulation • Articles focusing on economic success of countries • Articles taking financial institutions as the unit of analysis	278
Reading of full paper	Does the article offer a detailed description of the uncertainty (or its synonyms) dimension/measure? Does the article test/investigate/discuss the impact of uncertainty (or its synonyms) on MNCs' international decision-making? Does the article test/investigate/discuss MNCs' uncertainty management methods? The following articles were excluded: • Articles mentioning uncertainty (or its synonyms) without defining its dimensions or measures • Articles not identifying/discussing/testing uncertainty management methods	114

were identified in them. To provide a parsimonious categorization of uncertainty, Miller's (1992) classification[4] and definition of different types of uncertainty that refers to 13 dimensions of uncertainty grouped into three main categories was applied (See Figure 1).

The second phase of the analysis focused on identifying how uncertainty management approaches have been defined in the reviewed articles, and which approaches are most commonly applied by MNCs. Definitions derived from both Miller (1992) and Simangunsong, Hendry, and Stevenson (2012) were used to group the identified approaches, which refer to two main methods of uncertainty management (reducing and coping), under which there are eight uncertainty management approaches (See Figure 1).

In the final phase of analysis, the identified uncertainty dimensions and uncertainty management approaches were analyzed in terms of the capacity to add value to our understanding of MNCs' international decision-making (i.e., "how do the identified uncertainty dimensions and uncertainty management approaches enhance our understanding of MNCs" international decision-making?'). The review revealed several inconsistencies and debates among IB scholars about the impact of uncertainties on MNCs' decision-making and the determinants of MNC choices about uncertainty management approaches.

Figure 1. Integrative conceptual framework.



3. Findings

This paper presents an integrated framework (Figure 1) based on classifications of uncertainty dimensions and approaches to managing uncertainty. The main reason for using an integrated framework is the inconsistency in existing research regarding how concepts are used (See Table 2). This has made it problematic to draw conclusions about what we know about the role of uncertainty in MNCs' decision-making. The framework comprises uncertainty dimensions that have been modified based on the classification by Miller (1992) and also uncertainty management methods modified based on the work of Miller (1992) and Simangunsong et al. (2012). The framework was modified in response to the evidence emerging from the systematic literature review to include both modified and new types of uncertainty and uncertainty management approaches that were not anticipated in the original frameworks by Miller (1992) and Simangunsong et al. (2012). The five characteristics of individual decision-makers that were recognized in the reviewed literature as either having an impact on individual decision-makers' perceptions of uncertainty, or on the choice of uncertainty management approach, are not based on any pre-existing framework but emerged from this review.

The framework is contingency-based and draws on both contextual and individual influences on MNCs' uncertainty management in international decision-making. The contextual part is represented by different dimensions of uncertainty, both external and internal to the firm, which MNCs respond to in different ways. The individual influences concern how the characteristics of individual decision-makers influence both their perceptions of uncertainty and the MNC's approaches to uncertainty management. The interlinkages between the different elements of the framework are discussed in connection with this paper's proposed research agenda.

3.1. Dimensions of uncertainty

In order to promote greater consistency in the conceptualization of uncertainty dimensions in future research, this paper adopts Miller's (1992) classification of uncertainty. This comprises 13 dimensions of uncertainty organized under three different categories of uncertainty:

Table 2. Dimensions and measures of uncertainty in the IB literature

	Uncertainty dimensions	Terminology used	Uncertainty measures used	Example literature
Environmental uncertainties	Economic (U1) Uncertainty caused by fluctuations in economic activities: e.g., foreign currency exchange, infrastructure, efficiency of local institutions, inflation	Economic	*Country risk* measures by Erramilli and Rao (1993), Gatignon and Anderson (1988); high-risk countries measures by Goodnow and Hansz (1972)	Erramilli & D'Souza, 1995
		Institutional uncertainty	Subjective measures of *institutional voids* and *institutional uncertainty*	Santangelo & Meyer, 2011
	Political (U2) Uncertainty caused by inability to predict political developments: e.g., war resolution, changes in political turmoil	Country risk	*Host country risk* assessed from International Country Risk Guide, Business Environmental Risk Intelligence	Gaba et al., 2002
		Investment uncertainty	Subjective measures of *investment uncertainty* measured by the stability of the political, social and economic conditions, the risk of repatriating income, the risk of government actions against the firm	K. D. Brouthers et al., 2008
	Government (U3) Uncertainty caused by inability to predict regulatory developments: e.g., reforms, barriers to income repatriation, regulations, level of corruption	Government	Subjective measures on *government environmental policy* measured by scale on tax policies, laws, regulations, enforcement of laws	Lewis & Harvey, 2001
		Institutional environment	MNCs' perceptual measure on *institutional environment* measured by turbulence in government administration, regulations on domestic sales, export and import requirements, communication gaps, expatriates' regulations, sourcing of raw materials, restrictions on components' production, restrictions on ownership, requirements for technology transfer	Chiao et al., 2010
	Cultural (U4) Uncertainty about collective action when people are faced with differences between their own values and values of the institutions they are part of	Cultural	*Cultural distance* measured by a Euclidean distance version of Kogut and Singh (1988) index	Slangen & van Tulder, 2009

(*Continued*)

Table 2. (*Continued*)

	Uncertainty dimensions	Terminology used	Uncertainty measures used	Example literature
		Internal uncertainty	*Cultural distance* measures by Kogut and Singh (1988) based on cultural dimensions by Hofstede (1980)	Erramilli & D'Souza, 1995
	Discontinuous (U5) Uncertainty caused by nature itself, terrorist attacks, or technological disasters	Discontinuous risk	*Disaster severity* measured through no. incidents, no. people killed, duration of disaster	Oetzel & Oh, 2014
		Environmental issues	Subjective measures on *environmental issues* measured by climate change, pollution of air, water, soil, eco-efficiency, resource depletion, social welfare, eco-sufficiency	Lewis & Harvey, 2001
Industry uncertainties	Input (U6) Uncertainty associated with production inputs, acquisition of adequate quantities and qualities of inputs into production process	Industry risk	Subjective measures on *industry risk* measured by availability of inputs, raw materials and components; prices of inputs, raw materials and components; availability of human resources; availability of financial capital	Liu, Gao, Lu, & Lioliou, 2016
		Structural uncertainty	*Structural uncertainty* measured as geometric average of standard deviations in output, sales, and profit of the industry in which the firm operates	Luo, 2003
	Demand (U7) Uncertainty that relates to unexpected changes in demand, lack of availability of complementary products, and presence of substitute products	Munificence	*Industry sales* measured as average growth in net sales and operating income in the dominant industry as in Dess and Beard (1984)	Keats & Hitt, 1988
		Product market uncertainty	*Product market growth* measured by a geometric average of growth rates of gross output and the number of enterprises	Gaba et al., 2002
	Competition (U8) Unpredictability of the future state of competition in the host country market	Market turbulence	Subjective measures on market *turbulence measured* by changes in consumers and competitors faced by a firm	Tseng & Lee, 2010
		Dynamism	Subjective measures on *dynamism* measured by perceptions of competitors' actions	Baum & Wally, 2003

(*Continued*)

Table 2. (*Continued*)

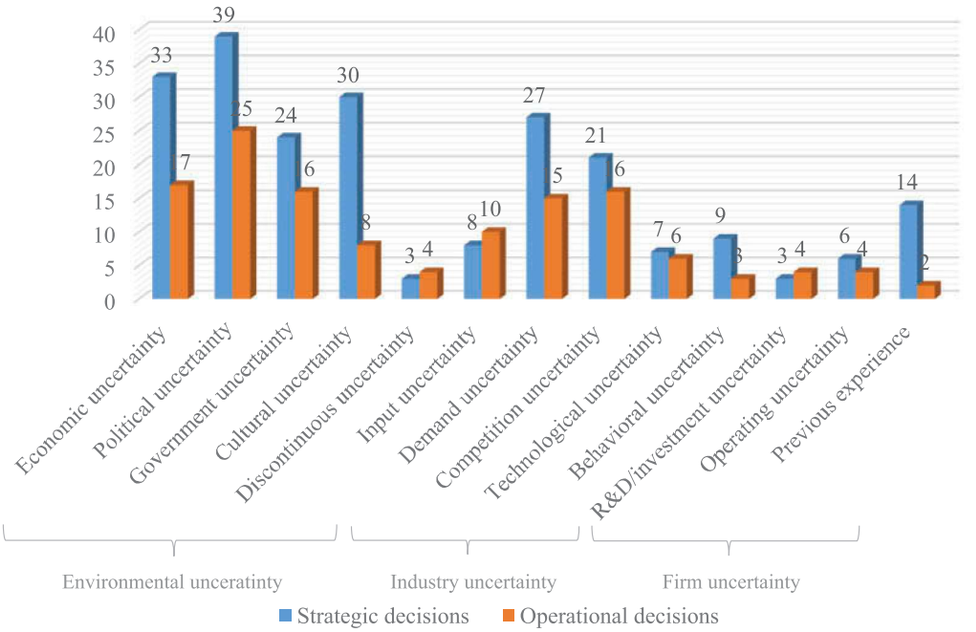
	Uncertainty dimensions	Terminology used	Uncertainty measures used	Example literature
	Techno-logical (U9) Uncertainty about the trade-offs between durability benefits vs old technology cost	Technological uncertainty	Subjective measures on *environmental technology* measured by product environmental attributes and impact, new products introduction, changes in production process	Lewis & Harvey, 2001
		Turbulence	*Technological turbulence* assessed by measures on competitive intensity, threats and opportunities from changes in firm's technological environment by Jaworski and Kohli (1993) and Cadogan, Paul, Salminen, Puumalainen, and Sundqvist (2001)	Cadogan et al., 2003
Firm uncertainties	Behavioral (U10) Inability to predict the actions and plans of potential partners or members within the firm	Behavioral	Subjective measures on the *behavior of environmental stakeholders* measured by scale on investors, community, supply chain, industry, opinion formers, regulators	Lewis & Harvey, 2001
		Control uncertainty	Subjective measures of *control uncertainty* from Brouthers and Brouthers (2003) measured by the cost of marketing and enforcing contracts, uncertainty over maintaining quality standards, the risk of dissemination of proprietary knowledge	Brouthers et al., 2008
	R&D (U11) Unpredictability of R&D results	Corporation sources	Not provided (conceptual paper)	Haley, 2003
		Venture-level uncertainty	*Return on investment* is measured by VentureXpert database classification—start-up, early stage, expansion, later stage	Liu & Maula, 2016
	Operating (U12) Uncertainty about operation of the firm and employees' productivity	Operation risk	Not provided (conceptual paper)	Miller, 1992
		Total strategic international risk	Subjective measures on *total risk* measured by averaging results of perceptions of control and market complexity risks	Brouthers, 1995

(*Continued*)

Table 2. (*Continued*)

	Uncertainty dimensions	Terminology used	Uncertainty measures used	Example literature
	Previous experience (U13) Firms' previous operating experience that has an impact on a host country risk perception and management approaches	Previous experience	Subjective measure on *international experience* measured by the ratio of foreign sales to total sales, the ratio of foreign assets to total assets, the ratio of foreign fixed assets to total fixed assets, the ratio of foreign employees to total employees and analyzed by exploratory factor analysis	Chiao et al., 2010
		Operational uncertainty	Operational uncertainty assessed as no. international operational modes a firm had undertaken prior to its entry into a foreign country; no. years a firm had been involved in international operations	Rhee & Cheng, 2002

Figure 2. Number of articles on researched dimensions of uncertainty.



environmental, industry, and firm uncertainties. Miller's (1992) framework was chosen because it is exhaustive and highly cited in IB research (e.g., Ahsan & Musteen, 2011; Clark, Li, & Shepherd, 2017; Erramilli & D'Souza, 1995; Oetzel & Oh, 2014). One potential drawback is that it was not based on a systematic review of the literature, nor has it been empirically examined in its complete original form. Nonetheless, this paper takes Miller's (1992) classification as a starting point and builds on it as follows: First, a closer examination of the IB literature resulted in an extension of the industry category of uncertainties by one dimension (i.e., *technological*). Second, the firm category of uncertainties was modified (i.e., removing *liability* and *credit* dimensions of uncertainty and adding *previous experience*), the *social* and *product* dimensions of uncertainty were relabeled *cultural* and *demand* uncertainties, and the *natural* dimension of uncertainty was relabeled *discontinuous* uncertainty. The 13 dimensions of uncertainty identified in the literature review illustrate the multifaceted and complex nature of uncertainty in IB. However, inconsistent use and measurement of the concepts made drawing conclusions on the existing knowledge of the role of uncertainty problematic. Although most scholars agree that MNCs employ different uncertainty management approaches in their decision-making, what is meant by uncertainty and how it is measured differs from study to study. Table 2 presents the most significant differences in conceptualization and measurement among the reviewed studies: studies are using different concepts of uncertainty for capturing the same dimension of uncertainty, studies use the same name of concepts for different uncertainties across categories, and studies are using different measures for the same dimension of uncertainty.

One of the main objectives of this paper was to systematically review the treatment of uncertainty in decision-making in the IB literature. Figure 2 illustrates that uncertainties in the *environmental uncertainty* category have attracted the greatest research attention both in regard to MNC strategic and operational decision-making. In particular, studies have examined environmental uncertainty in terms of political (U2) (e.g., Agarwal & Ramaswami, 1992; Delios & Henisz, 2003a; Kobrin, 1979), economic (U1) (e.g., Brouthers & Dikova, 2010; Prater, Biehl, & Smith, 2001; Song, 2015) and government (U3) (Akhter & Robles, 2006; Chiao, Lo, & Yu, 2010; Eroglu, 1992) uncertainties in the host country, and thus focus on the formal part of a country's environment. Other studies examine environmental uncertainty in terms of cultural uncertainty (U4) (e.g., Cho &

Padmanabhan, 2005; Dow, Cuypers, & Ertug, 2016) that emerges between the home and host countries, and therefore focus on the informal part of the country's environment.

Several other studies have directed attention on to the impact of *industry uncertainties*. For example, Elango and Sambharya (2004) found that competition and demand uncertainties have a significant impact on MNCs' entry mode decisions. Gray (1994) places more focus on technological uncertainty in MNCs' entry mode decisions. Among the different dimensions of uncertainty in the *firm uncertainty* category, the MNC's previous experience has attracted the greatest research attention and is broadly recognized as having an impact on an MNCs' identification and perception of various other dimensions of uncertainties (Brouthers, 1995), entry mode choice decisions (Brouthers, Brouthers, & Werner, 2008), or location decisions (Delios & Henisz, 2003b).

Although IB scholars acknowledge the existence of different categories of uncertainty, studies investigating the impact of uncertainty dimensions *within* one category (e.g., that of the environment or industry uncertainty) dominate in the IB field. Among the 114 reviewed studies, 32 investigate the impact of environmental dimensions of uncertainty (with 18 studies —on operational decisions, seven studies on entry mode, four studies on location decisions, two studies on divestment, and one study on an international joint venture ownership decision), and 14 studies investigate the impact of industry dimensions of uncertainty (with nine studies on operational decisions, three studies on entry mode, one study on location, and one study on decision speed). There is a gradual move toward the integration of uncertainties from different categories: 20 studies investigate the simultaneous impact of both environmental and industry dimensions of uncertainty. Nevertheless, empirical research on different categories of uncertainty has generally taken place across studies rather than within single studies. Articles that do consider the impact of two or all three categories of uncertainties are mostly conceptual. Table 3 summarizes IB studies based on the number of uncertainty categories studied per article.

3.2. Uncertainty management

Turning to the approaches MNCs apply when managing uncertainty, Miller's (1992) and Simangunsong et al.'s (2012) uncertainty management frameworks were used as a starting point[5]. More specifically, this review incorporates Simangunsong et al.'s (2012) two uncertainty management methods: *uncertainty reduction* (referred to as "financial risk" management by Miller), and *uncertainty coping* (referred to as "strategic management" by Miller). Uncertainty reduction minimizes an MNC's exposure to particular uncertainties without changing the firm's strategy (Miller, 1992). Uncertainty reduction is a natural, primary motivator and fundamental need that guides MNCs' behavior (Beckman, Haunschild, & Phillips, 2004; Mullin & Hogg, 1998). Uncertainty coping, on the other hand, impacts the MNC's exposure across a wide range of uncertainties and in some cases requires the MNC to change its strategy (Miller, 1992). Although the two concepts are the same in both frameworks, this paper adopts Simangunsong et al.'s (2012) terminology since the reviewed IB literature most often refers to uncertainty management in terms of reduction and coping rather than financial and strategic risk management. Table 4 presents the extant literature against the two methods of uncertainty management: three approaches to reduction, and five approaches to coping.

3.3. Uncertainty reduction

The review of the selected articles facilitated the identification of three approaches to uncertainty reduction: information gathering (R1), proactive collaboration/cooperation (R2), and networking (R3). Information gathering (R1) and networking (R3) emerged solely from the reviewed literature and are not mentioned in either of the two frameworks. Collaboration (R2) emerged from the literature review and is also listed among Simangunsong et al.'s (2012) approaches to uncertainty reduction. Since the reviewed literature uses the terms collaboration and cooperation interchangeably, this paper integrates them.

Table 3. Uncertainty categories and frequency in the reviewed articles

MNC decision type	Article type	Number of studies	Uncertainty categories considered per study		
			Environmental uncertainties	Industry uncertainties	Firm uncertainties
Operational	Empirical	**18**	■		
	Example literature: Desbordes, 2007; Gaur et al., 2007; Jiménez, 2010; Jiménez, Benito-Osorio, Puck, & Klopf, 2017; Jiménez & Delgado-Garciá, 2012; Jiménez, Luis-Rico, & Benito-Osorio, 2014; Keillor, Wilkinson, & Owens, 2005; Kelly & Philippatos, 1982; Kennedy, 1984				
Operational	Empirical	**9**		■	
	Example literature: Celly, Spekman, & Kamauff, 1999; Chattopadhyay, Glick, & Huber, 2001; Chen & Kamal, 2016; Cui, Griffith, Cavusgil, & Dabic, 2006; Hodgkinson et al., 2016; Keats & Hitt, 1988; Lee & Makhija, 2009a; Liu et al., 2012				
Operational	Empirical	**10**	■	■	
	Example literature: Achrol & Stern, 1988; Gaba et al., 2002; Galang, 2012; Griffith, Harmancioglu, & Droge, 2009; Grunert et al., 2010; Liu et al., 2016; Luo, 2003; Manolis, Nygaard, & Stillerud, 1997; Mascarenhas, 1982				
Operational	Empirical	**3**		■	■
	Example literature: Beckman et al., 2004; Ottesen & Grønhaug, 2004; Sartor & Beamish, 2014				
Operational	Empirical	**1**	■		■
	Example literature: Xu et al., 2004				
Operational	Conceptual/ Theoretical	**4**	■		
	Example literature: Akhter & Choudhry, 1993; Di Gregorio, 2005; Spich & Grosse, 2005				
Operational	Conceptual	**3**	■	■	■
	Example literature: Haley, 2003; Miller, 1992; Sashi & Karuppur, 2002				
Entry mode	Empirical	**7**	■		
	Example literature: Dow et al., 2016; Erramilli & D'Souza, 1995; Hong & Lee, 2015; López-Duarte & Vidal-Suárez, 2010; Malhotra, Lin, & Farrell, 2016; Slangen & van Tulder, 2009; Williams, Lukoianova, & Martinez, 2017				
Entry mode	Empirical	**3**		■	
	Example literature: Cadogan et al., 2003; Elango & Sambharya, 2004; J. Li & Li, 2010				
Entry mode	Empirical	**8**	■	■	

(*Continued*)

Table 3. (*Continued*)

MNC decision type	Article type	Number of studies	Uncertainty categories considered per study		
			Environmental uncertainties	Industry uncertainties	Firm uncertainties
	Example literature: L. E. Brouthers, Brouthers, & Werner, 2000; K. D. Brouthers, Brouthers, & Werner, 2002; Campa, 1994; Dickson & Weaver, 1997; Gray, 1994; Luo, 2001; Morschett et al., 2010; Sanchez-Peinado & Pla-Barber, 2006				
Entry mode	Empirical	**7**	■	■	■
	Example literature: Brouthers, 1995; Brouthers et al., 2008; Brouthers & Dikova, 2010; Chiao et al., 2010; Li & Rugman, 2007; Whitelock & Jobber, 2004; Zafar, Mohamad, Tan, & Johnson, 2002				
Entry mode	Empirical	**7**	■		■
	Example literature: Agarwal & Ramaswami, 1992; Brouthers & Brouthers, 2003; Cho & Padmanabhan, 2005; Delios & Henisz, 2003a; Henisz & Delios, 2001; Ji & Dimitratos, 2013				
Entry mode	Empirical	**1**		■	■
	Example literature: Sutcliffe & Zaheer, 1998				
Entry mode	Conceptual	**2**	■	■	■
	Example literature: Akhter & Robles, 2006; Eroglu, 1992				
Location	Empirical	**4**	■		
	Example literature: Arregle, Miller, Hitt, & Beamish, 2016; Duanmu, 2012; Kraus, Ambos, Eggers, & Cesinger, 2015; Oetzel & Oh, 2014				
Location	Empirical	**1**		■	■
	Example literature: Dowell & Killaly, 2009				
Location	Empirical	**2**	■		■
	Example literature: Delios & Henisz, 2003b; Lien & Filatotchev, 2015				
Location	Conceptual	**1**	■	■	■
	Example literature: Burgers & Padgett, 2009				
Location	Conceptual	**1**		■	
	Example literature: Siqueira, Priem, & Parente, 2015				
Divestment	Empirical	**2**	■		
	Example literature: Berry, 2013; Song, 2014				

(*Continued*)

Table 3. (*Continued*)

MNC decision type	Article type	Number of studies	Uncertainty categories considered per study		
			Environmental uncertainties	Industry uncertainties	Firm uncertainties
Decision speed	Empirical	**1**			
	Example literature: Baum & Wally, 2003				
Decision speed	Empirical	**1**			
	Example literature: Rhee & Cheng, 2002				
IJV ownership	Empirical	**1**			
	Example literature: Piaskowska & Trojanowski, 2014				
IJV ownership	Empirical	**2**			
	Example literature: Cuypers & Martin, 2010; Liu & Maula, 2016				
IJV ownership	Empirical	**2**			
	Example literature: Mayrhofer, 2004; Tsang, 2005				

Table 4. Approaches to uncertainty management in the IB literature

	Uncertainty management approaches	Description	Example literature
Uncertainty Reduction	(R1) Information gathering	Complete uncertainty reduction: gathering information until the decision-making point where analytic comprehensiveness of the environment is achieved.	Grunert et al., 2010; Ji & Dimitratos, 2013; Keats & Hitt, 1988; Ottesen & Grønhaug, 2004; Petersen et al., 2008
	(R2) Proactive collaboration/cooperation	Collaboration with local subsidiaries to reduce uncertainties related to the general environment, industry and firm.	Brouthers et al., 2008; Slangen & van Tulder, 2009
	(R3) Networking	Generation of information about a firm's market through establishing new or reinforcing already existing networks, the dissemination of this information to relevant decision-makers, and development and implementation of responses.	Beckman et al., 2004; Luo, 2003
Uncertainty Coping	(C1) Flexibility	Organizational ability to adapt to uncertain and fast-changing environmental conditions: - Diversification of geographic markets or products, -Operational adaptation.	Chattopadhyay et al., 2001; Chiao et al., 2010; Lee & Makhija, 2009a; Lee & Makhija, 2009b; Li & Li, 2010; Liu et al., 2012; Sanchez-Peinado & Pla-Barber, 2006; Sashi & Karuppur, 2002
	(C2) Imitation	Imitation of rival organizations' strategies and actions.	Gaba et al., 2002; Miller, 1992
	(C3) Reactive collaboration/cooperation	Multilateral agreements that are used to increase the predictability of environmental conditions: -JV or Alliances, -Franchising/Licensing, -Agreements.	Akhter & Robles, 2006; Brouthers, 1995; Brouthers & Brouthers, 2003; Brouthers et al., 2008; Burgers & Padgett, 2009; Cuypers & Martin, 2010; Dickson & Weaver, 1997; Eroglu, 1992; Erramilli & D'Souza, 1995; Miller, 1992; Sutcliffe & Zaheer, 1998
	(C4) Control	Market control to threaten and push competitors into more predictable behavior Unilateral control of operations: -Vertical integration, -Horizontal integration, -Market Control (includes the speed of the decision).	Akhter & Robles, 2006; Baum & Wally, 2003; Brouthers et al., 2002; Brouthers & Brouthers, 2003; Brouthers et al., 2008; Brouthers & Dikova, 2010; Burgers & Padgett, 2009; Mayrhofer, 2004; Morschett et al., 2010; Sanchez-Peinado & Pla-Barber, 2006; Tseng & Lee, 2010
	(C5) Avoidance	Postponement of the company's actions until uncertainty level faced by the company is acceptable.	Dowell & Killaly, 2009; Whitelock & Jobber, 2004

Information gathering (R1) as an uncertainty reduction approach is used by MNCs that avoid risky decisions and act when the gathered information is considered enough to achieve analytical comprehensiveness of the environment (e.g., Brouthers et al., 2008; Ji & Dimitratos, 2013). Studies reveal that information gathering is an approach to uncertainty reduction where the MNCs scan the external environments and collect necessary data without the involvement of other partners. Information gathering is the most frequently implemented approach adopted to reduce uncertainty and is primarily used to minimize demand, competition, and cultural uncertainties (e.g., Cadogan, Cui, & Li, 2003; Grunert, Trondsen, Campos, & Young, 2010; Keats & Hitt, 1988; Petersen, Pedersen, & Lyles, 2008; Rhee & Cheng, 2002).

Proactive collaboration/cooperation (R2) is another way to increase the predictability of the conditions in the external environment. Information sharing is an essential part of collaboration/cooperation (Simangunsong et al., 2012). The IB literature talks about collaboration/cooperation in the form of vertical integration and contractual agreements that MNCs have with their local partners for collaborative planning and forecasting to reduce external uncertainties (Brouthers et al., 2008; Slangen & van Tulder, 2009). The literature suggests that environmental uncertainties and the dimensions of industry uncertainties such as demand and competition can be reduced through collaboration/cooperation with local partners (Brouthers et al., 2008; Slangen & van Tulder, 2009).

Uncertainty can be reduced through networking (R3). As IB studies reveal, uncertainty reduction through networking (R3) happens when the MNC collects data through its social relationships and via the reinforcement of existing networks (Luo, 2003; Ottesen & Grønhaug, 2004). As such, proactive collaboration/cooperation (R2) can be a part of networking (R3) and happens within larger networks (Ottesen & Grønhaug, 2004). In the IB literature, networking is primarily used to reduce industry uncertainties: input, demand and competition (e.g., Beckman et al., 2004; Luo, 2003).

3.4. Uncertainty coping

The reviewed IB literature identifies five approaches that are consistent with Miller's five approaches to coping with uncertainty. These approaches are: flexibility (C1), imitation (C2), reactive collaboration/cooperation (C3), control (C4) and avoidance (C5). Of these, flexibility[6] (C1), collaboration/cooperation[7] (C3) and avoidance[8] (C5) are also among the approaches noted by Simangunsong et al. (2012).

Flexibility (C1) is exhibited as diversification and operational adaptation. Diversification helps the MNC cope with industry uncertainties through its involvement in different markets or diversification of its products (e.g., Chiao et al., 2010; Liu, Shah, & Babakus, 2012). Operational adaptation is sought through adaptation of organizational structure or strategy. As an example, under high internal uncertainty some MNCs shift from FDI to non-equity modes (Lee & Makhija, 2009a).

To cope with uncertainty some MNCs choose imitation (C2). By mimicking a rival's strategy, MNCs assume that the rival's actions incorporate learning that will help to avoid the errors of early movers (Gaba, Pan, & Ungson, 2002). However, an industry leader would be able to predict the response of competitors due to their responses being mere imitations of its own strategic actions (Miller, 1992). In the context of international decision-making, political, government, cultural, demand, and competition uncertainties can be managed through the imitation of competitors' actions (e.g., Gaba et al., 2002).

The reviewed literature revealed that reactive collaboration/cooperation (C3) is the most common approach taken to cope with environmental and industry uncertainties (e.g., Brouthers, 1995; Brouthers & Brouthers, 2003; Dickson & Weaver, 1997; López-Duarte & Vidal-Suárez, 2010; Morschett, Schramm-Klein, & Swoboda, 2010; Tseng & Lee, 2010). As environmental and industry uncertainties increase, MNCs tend to select strategies that shift the uncertainty and risk to their

partners (Brouthers, 1995). However, collaboration/cooperation becomes less valuable in the presence of high growth potential (J. Li & Li, 2010).

MNCs may choose unilaterally to control (C4) uncertainty rather than to passively accept its conditions. Control entry modes are frequently observed among knowledge-intensive MNCs (Sanchez-Peinado & Pla-Barber, 2006). Vertical integration with suppliers is used as an attempt to control input and demand uncertainties (e.g., Akhter & Robles, 2006). Horizontal integration (e.g., mergers and acquisitions) is used to control uncertainties related to competition, particularly during the transformation stage of an economy where an MNC operates (Burgers & Padgett, 2009; Mayrhofer, 2004).

Uncertainty avoidance (C5) takes place when the level of both environmental and industry uncertainties faced by the MNC is unacceptable. MNCs postpone their action as a means of complete uncertainty avoidance until the value of an investment opportunity can be accurately predicted (e.g., Dowell & Killaly, 2009; Whitelock & Jobber, 2004).

3.5. Determinants of the choice of uncertainty management approach

The reviewed literature revealed that the following two factors influence the MNC's choice of a particular uncertainty management approach: the theoretical background of the research and the specific decision-makers within the MNC. Regarding the theoretical background of the research, studies that apply, for example, a real option theory perspective report the use of the reactive collaboration/cooperation (C3) approach to uncertainty management (e.g., Brouthers et al., 2008; Cuypers & Martin, 2010; Li & Li, 2010). This theory encourages MNCs to consider environmental uncertainty since it is not only a challenge for decision-making, but offers an opportunity in the long-term (e.g., Li & Li, 2010). Studies applying a transaction cost perspective, in contrast, report the use of control (C4) (e.g., Akhter & Robles, 2006; Tseng & Lee, 2010), while studies applying an internationalization perspective report the incremental use of both information gathering (R1) (e.g., Petersen et al., 2008; Rhee & Cheng, 2002;) and reactive collaboration/cooperation (C3) approaches to uncertainty management (e.g., Sanchez-Peinado & Pla-Barber, 2006).

Second, among the 114 reviewed articles, 22 place a strong emphasis on individual decision-makers as the determiners of the uncertainty management approaches used by an MNC, particularly in situations where MNC behavior deviates from that predicted by theoretical models (e.g., in the studies by Gray, 1994,; Richards & Yang, 2007). Therefore, this paper scrutinizes individual decision-makers and their characteristics to understand their impact on their MNC's choice of uncertainty management approach.

The systematic review regarding individual-level characteristics of decision-makers was approached inductively (i.e., no underlying classification was used). Hence, the following characteristics emerged from the review: previous decision-making experience (I1), tolerance of ambiguity (I2), individualistic/collectivistic orientation (I3), hierarchical position in the organization (I4), decision-making orientation (I5) (See Table 5).

Previous decision-making experience (I1), or lack of it, can have a significant impact on uncertainty perception and the desire for control (e.g., Makhija & Stewart, 2002; Whitelock & Jobber, 2004). More specifically, the less managerial experience a manager had, the higher the level of perceived uncertainty and the greater the chance that a third party would be involved in the control of foreign operations (Brouthers, 1995).

The reviewed literature identifies two of Hofstede's (1980) cultural dimensions that have been applied at the individual level to illustrate how the characteristics of individual decision-makers shape their perceptions of uncertainty: uncertainty avoidance—more frequently referred to in the literature on international decision-making as *tolerance for ambiguity* (I2)—and

Table 5. Characteristics of individual decision-makers and their influence on approaches to uncertainty management in the IB literature

	Characteristics of individual decision-makers	Terminology used	Effect on decision-making	Example literature
I1	Previous decision-making experience	Previous experience	Lack of previous decision-making experience leads to a higher level of perceived uncertainty and therefore more collaborative uncertainty management approaches	Brouthers, 1995; Makhija & Stewart, 2002; Reid, 1981; Whitelock & Jobber, 2004
		Operating experience		Eroglu, 1992
I2	Tolerance for ambiguity	Cognitive complexity	Decision-makers with higher tolerance for ambiguity have more accurate perceptions of the environment. Thus, they reduce uncertainty by gathering extra information and performing environmental scanning activities	Yasai-Ardekani, 1986
		Education, knowledge of foreign languages, extent of foreign travel		Reid, 1981
		Tolerance for ambiguity		Eroglu, 1992; Grunert et al., 2010; Makhija & Stewart, 2002
I3	Individualistic/collectivistic orientation	Cultural orientation: individualistic vs collectivistic tendencies	Managers with individualistic orientation are more restrained towards alliances in the foreign markets. Managers with more collectivistic orientation value cooperative uncertainty management	Dickson & Weaver, 1997; Makhija & Stewart, 2002
		Tolerance for risk		Eroglu, 1992
I4	Hierarchical position in the organization	Organizational positions	Managers in higher hierarchical positions have a better access to environmental scanning and information processing than managers in lower hierarchical positions. Therefore, information gathering and reduction of uncertainty becomes easier for the managers in higher positions.	Yasai-Ardekani, 1986
I5	Decision-making orientation	Decision-making orientation	Managers with more entrepreneurial orientation are higher risk takers than managers with conservative environmental orientation	Makhija & Stewart, 2002; Petersen et al., 2008; Reid, 1981
		Entrepreneurial vs conservative orientation		Dickson & Weaver, 1997
		International orientation: perceived risk vs perceived benefit		Eroglu, 1992

individualistic/collectivistic orientation (I3). Tolerance for ambiguity (I2) refers to the tendency of certain decision-makers to perceive ambiguous situations as desirable (Eroglu, 1992). A clear distinction is that individuals with a low tolerance for ambiguity tend to cease their information processing activities early and are resistant to new information. Individuals that are more tolerant of ambiguity are more receptive to external information (Makhija & Stewart, 2002; Yasai-Ardekani, 1986). In IB studies, decision-makers with a low tolerance for ambiguity commit resources to foreign markets only if environmental and industry uncertainties are reduced to a level beneath the maximum tolerable risk. However, it remains unclear how ambiguity-averse decision-makers behave if the perceived environmental and industry uncertainties increase with time (Petersen et al., 2008). According to the maximum tolerable risk logic, the solution is to withdraw from the foreign market (Johanson & Vahlne, 1977). However, there is a need for more empirical research to understand the actual behavior of individual decision-makers with different levels of tolerance for ambiguity.

The *individualistic/collectivistic orientation* (I3) of managers is shown to influence their perceptions of the uncertainties facing the MNC. Managers with an individualistic orientation value independence and self-sufficiency, and place high value on self-direction, social justice, and equality (Dickson & Weaver, 1997). In practice, these managers are less influenced by perceived environmental uncertainty and more restrained toward alliances in foreign markets (Dickson & Weaver, 1997). Managers with collectivist orientations emphasize the importance of belonging to a group, of value cooperation within a group, and expect help from the group. These managers are more positive toward alliances and are more influenced by perceived environmental uncertainty (Dickson & Weaver, 1997; Makhija & Stewart, 2002).

Hierarchical position in the organization (I4), which includes organizational roles, experiences, beliefs and ideologies, is shown to affect uncertainty perceptions (Yasai-Ardekani, 1986). The general argument is that organizational structure affects environmental scanning and information processing, including information access, interpretation, and transmission. Managers in higher hierarchical positions have better access to environmental scanning and information processing than managers in lower hierarchical positions. Therefore, information gathering, and the reduction of uncertainty becomes easier for managers in higher positions. Furthermore, an individual's hierarchical position influences the perception of the external environment (Sonnenfeld, 1981as in Yasai-Ardekani, 1986).

The frame of mind in which decision-makers process information is referred to as *decision-making orientation* (I5) (Makhija & Stewart, 2002). There is a significant difference in how decision-makers with an entrepreneurial and innovative decision-making orientation and decision-makers with a more conservative decision-making orientation react to environmental uncertainties (Dickson & Weaver, 1997). Decision-makers with a more entrepreneurial orientation are characterized by greater risk taking and are less likely to perceive the situation as threatening (Hodgkinson, Hughes, & Arshad, 2016). The international entrepreneurship literature assumes that decision-makers are risk takers who focus on foreign market opportunities rather than risks. Accordingly, proactive and risk-seeking decision-makers translate risk into unknown, but promising, future business opportunities (Johanson & Vahlne, 1977; Petersen et al., 2008).

4. Toward a future research agenda

Based on this systematic literature review, it is possible to make three observations about the main limitations of existing research in the IB field. These limitations are: (i) inconsistency in the conceptualization and measurement of uncertainty, (ii) lack of diversity regarding uncertainty dimensions within single studies, and (iii) the downplayed role of individual decision-makers. After briefly explaining each of these limitations in turn, and why they are problematic for knowledge development, the paper offers some specific suggestions for how future research could address them. These suggestions for future research are represented as dotted lines in Figure 1.

4.1. Toward more consistent choices in the conceptualization and measurement of uncertainty

The first limitation observed is the inconsistency in the conceptualization and measurement of uncertainty, which has been the subject of much debate among scholars. The kind of conceptual inconsistencies where articles use the same concept to capture different dimensions of uncertainty across categories (see Table 2) could partly explain these debates. Studies compare the relative impact of different dimensions of uncertainty on MNC decision-making and draw different conclusions. A number of studies identify environmental factors as having the most significant impact on MNCs' choice of entry mode (e.g., Agarwal & Ramaswami, 1992; Brouthers & Brouthers, 2003; Brouthers et al., 2008; Eroglu, 1992; Erramilli & D'Souza, 1995; Ji & Dimitratos, 2013), while others suggest industry factors have the greatest impact on constraining those decisions (Cadogan et al., 2003; Elango & Sambharya, 2004; Li & Li, 2010; Sutcliffe & Zaheer, 1998). Furthermore, similar inconsistencies are observed within categories of uncertainty when different concepts are used to capture the same dimension of uncertainty. In terms of environmental uncertainties, contradictions around political and cultural uncertainties are the most common. Political uncertainty is recognized to have a significant impact on MNCs' internationalization (e.g., Henisz & Delios, 2001; Jiménez, 2010), market selection (e.g., Duanmu, 2012; Henisz & Delios, 2001) and/or divestment decisions (e.g., Berry, 2013). While political uncertainty is the most researched uncertainty in the IB literature, Slangen and van Tulder's (2009) research shows that studies that have conceptualized environmental uncertainty in terms of political uncertainty, have focused on a relatively unimportant aspect of a country's formal institutional environment, and go on to conclude that governmental uncertainty may be a better proxy for environmental uncertainty. Similar debates have been observed around cultural uncertainty: Cho and Padmanabhan (2005) illustrate the importance of cultural uncertainty in determining the ownership type involved in MNCs' entry mode decisions, while other studies (e.g., Luo, 2001; Slangen & van Tulder, 2009) indicate cultural uncertainty is a less relevant driver of MNC decision-making or even irrelevant to it.

Inconsistencies in the way uncertainty is measured can also partly be seen as contributing to these conflicting findings. For example, the finding by Slangen and van Tulder (2009) on government uncertainty being a better proxy for external environment uncertainty than political uncertainty can be explained through the integration of different measures for similar dimensions of uncertainty. The study uses Kaufmann et al.'s (2004) measures for political uncertainty as a sudden regime change. Decision-makers may pay relatively little attention to this likelihood while making, for example, entry mode decisions. Furthermore, in spite of the fact that most of the reviewed studies looked at MNC assessments of political uncertainty, they still measure political instability rather than the potential impact of politics on the firm (cf. Delios & Henisz, 2003a, 2003b; Henisz & Delios, 2001; Kobrin, 1979). Another example, the study by Gaur, Delios, and Singh (2007) revealed that MNCs rely more on expatriates in situations marked by high levels of governmental and political uncertainty. The study by Xu, Pan, and Beamish (2004) found the opposite: greater government and political uncertainty is associated with a lower level of equity ownership and a lower expatriate presence. However, a deeper analysis of these studies revealed that Gaur et al. (2007) measure governmental and political uncertainties through governmental and political indices of the host country, while Xu et al. (2004) focus more on demand forecasts of the host country and a firm's operational effectiveness. In terms of the measures of cultural uncertainty, linguistic and religious distances have a greater impact on MNCs' behavior than more traditional measurements of cultural uncertainty (Dow et al., 2016). Cultural distance has been criticized as being a less relevant driver of managerial decision-making than perceptions regarding the host market's environment (Xu & Shenkar, 2002).

In sum, inconsistencies in the conceptualization and measurement of uncertainty are problematic because they fragment our knowledge of the field and, most significantly, impede the development of our accumulative knowledge about uncertainty and its effects. Those inconsistencies have inhibited our understanding about *what* uncertainties MNCs actually prioritize when making international decisions, and has impeded our understanding of *how* an MNC prioritizes

the uncertainties it recognizes and how that affects its decisions. The same inconsistencies prevent us accurately evaluating the contextual environment within which MNCs operate and within which decisions are made (Di Gregorio, 2005). Furthermore, the diverse ways in which different uncertainties are conceptualized and measured presents a threat to the validity of empirical studies, and ultimately to theory development (Delios & Henisz, 2003a).

In light of these limitations, two main recommendations for future research are offered. First, future research should choose dimensions of uncertainty that are more conceptually and statistically parsimonious in order to prevent further confusion. Miller (1993) and Werner, Brouthers, and Brouthers (1996), for instance, recommend choosing uncertainty concepts that are inter-related and consistent with previous studies on uncertainty. They offer dimensions of uncertainty that are theoretically justified and exhibit construct and discriminant validity. Therefore, this paper recommends integrating similar types of uncertainty constructs into future research to achieve more comprehensive measures. To address these methodological issues, future research questions might include: "What is the nature of the relationship between different dimensions of uncertainty at the conceptual level, and which constructs should be included in future efforts at scale development? To what extent is the grouping of different constructs of uncertainty generalizable across industries and countries, or do they interact in different ways?"

Second, since most of today's uncertainty measures are objective and taken from country reports (84 quantitative studies out of the total 114 articles reviewed use statistical indices of the countries to measure MNC's uncertainties), our understanding of MNC decision-making tends not to be based on the subjective reality of the uncertainties faced by the actual decision-makers. This is problematic, since this fails to acknowledge that people and teams make decisions, not the organization, and thus ignores a potentially wide and powerful range of explanations behind MNC decision-making that could complement existing theories and models. As studies have shown, some individual decision-makers might perceive specific uncertainties differently than the rest of the MNC management, or not acknowledge them at all (Kiss, Williams, & Houghton, 2013). Therefore, more studies that integrate subjective measures of uncertainty are needed in order to understand how decision-makers within MNCs actually differentiate between, and respond to, different dimensions of uncertainty. Subjective measurements of uncertainty are more likely to provide findings that are representative of what individual decision-makers actually experience (e.g., as in Petersen et al., 2008 or Whitelock & Jobber, 2004).

In a recent study, Haley found over 80 percent of MNC managers used qualitative personal judgments to assess uncertainty, while fewer than 20 per cent used statistical techniques (2003). Therefore, the integration of more subjective measures of uncertainty could provide a more realistic account of how MNCs perceive and prioritize different uncertainties. Future research questions could thus address the following kinds of questions: How much heterogeneity exists in the subjective perception of different kinds of uncertainty between MNC decision-makers? To what extent does this heterogeneity provide grounds for aggregation at the MNC level? How does heterogeneity and homogeneity in uncertainty perceptions influence decision-making? By integrating dimensions of uncertainty that are more conceptually and statistically parsimonious, and through the use of more subjective measures, it is possible to improve the predictive power of different theoretical models of MNC behavior under conditions of uncertainty.

4.2. Addressing the lack of diversity in uncertainty dimensions included within single studies

The second limitation in existing IB research is that studies tend to focus on uncertainties solely within one category (i.e., environmental or industry category) and largely overlook firm-level dimensions of uncertainty. As the reviewed literature revealed, environmental and industry uncertainties can be managed through different approaches. These interlinkages are shown as two solid arrows from environmental and industry uncertainties to uncertainty management methods in Figure 1. A dotted arrow that connects firm uncertainties and uncertainty management approaches denotes that more research is needed. Although there has been a move toward

integrating uncertainties from different categories (e.g., Beckman et al., 2004; Brouthers et al., 2008; Galang, 2012; Henisz & Delios, 2001; Liu & Maula, 2016), the vast majority of studies examine uncertainties in parallel rather than together within the same study (see Table 3). This is a major shortcoming since a focus on only one uncertainty, such as political uncertainty, can lead to ill-informed entry mode decisions if other uncertainties are ignored (e.g., Brouthers, 1995). Empirical studies have found significant relationships between one or more uncertainty dimensions and MNC entry mode choice (Ahmed, Mohamad, Tan, & Johnson, 2002). However, the interlinkages between different categories of uncertainty and their effects on uncertainty management and decision-making remain largely unexplored in IB research.

In particular, uncertainties at the firm level are under-explored in IB studies compared to environmental and industry dimensions of uncertainty (See Figure 2). This is problematic since, according to the strategy tripod model (Peng, Wang, & Jiang, 2008), strategic decisions by MNCs are influenced by environmental, industry, and firm-specific factors, and thus uncertainties in all three categories should be considered equally. Within the IB field, location and entry mode decisions are the strategic decision-making activities that have received by far the most research attention. However, this systematic literature review reveals that the studies that examine these decisions primarily investigate the impact of either environmental or industry uncertainties and largely downplay the role of firm uncertainties (See Table 3). A similar pattern is evident when examining research on the operational decisions of MNCs; firm dimensions of uncertainty are usually overlooked.

Not including a wider spectrum of uncertainties within single studies prevents us from understanding the relationships between them and only presents with partial explanations for MNC decision-making. Including several dimensions not only helps to address this, but also provides a picture that is closer to the empirical reality that decision-makers within MNCs have to confront. One such example is that IB research appears to be more concerned with environmental or industry uncertainties, while MNCs are reported to be more focused on resolving firm uncertainties in the course of international decision-making. As Buckley, Devinney, and Louviere (2007) observed, MNCs planning international activities tend to follow theoretically predictive paths. However, the actual implementation of these activities is less aligned with traditional models. As the authors explain, decision-makers pay more attention to firm-related uncertainties (e.g., ROI, production cost, exploitation and protection of assets) when they implement decisions, and less to environmental uncertainty (e.g., political instability), which tends to be a factor considered more during the planning stage. By considering firm dimensions of uncertainty along with environmental and industry uncertainties, international decision-making models will not only acquire an enhanced ability to explain the kind of MNC behavioral variation that is observed, but will also open opportunities to examine the interactions between the different types of uncertainty alluded to above.

In terms of future research, due to the complex business environments in which MNCs operate, the trade-off among different dimensions of uncertainty and understanding their contextual effect on decision-making remains crucial within the field of IB. However, it is important to understand not only how one category of uncertainty is managed, but how the simultaneous impact of multiple uncertainties from different categories influences how MNC operations are and should be managed. Accordingly, future research should address the following kinds of research questions: "On what dimensions of uncertainty do decision-makers tend to concentrate during international decision-making? Why is this and what effect does this have on decisions? What uncertainty management methods do MNCs choose when they face various uncertainties across different categories, and do these methods vary based on the type of uncertainties they face?" Some scholars offer more specific questions, such as: "Does the multilevel interaction of factors at nation-, industry-, firm-, and project-levels influence entry choice? Does the proper alignment of entry mode choice with external and internal antecedents actually lead to superior performance?" (Luo, 2001, p. 467) and "How do firm- and country- level variables in addition to industry-level

variables influence the three types of MNC entry mode (i.e., greenfield, acquisition, joint venture)?" (Elango & Sambharya, 2004, p. 121).

This paper also encourages more research on firm uncertainties. External uncertainties at the environmental and industry level have been incorporated more frequently than internal, firm-related uncertainties. A potential explanation is that firm uncertainties are considered more controllable than industry or environmental uncertainties (Beckman et al., 2004). However, empirical research on the management of firm uncertainties (e.g., R&D uncertainty, operating uncertainty) remains very limited. Furthermore, the reviewed studies revealed conflicting findings about the impact of previous experience on international decision-making. Future research on these dimensions of uncertainty would serve to enhance our understanding about the impact of firm-level uncertainties on MNCs' international activities. Research questions might include: What kinds of firm uncertainties are the most important in decision-making, and when and how are these uncertainties considered by MNCs? How do MNCs approach the management of firm uncertainties during their international decision-making?

4.3. Addressing the role of individual decision-makers

Finally, the role and impact of individual managers' perceptions of uncertainty, and their choice of uncertainty management approaches, remain largely overlooked. Consideration of individual managers as decision-makers has far-reaching implications for researching MNCs and understanding the way in which multinationals operate (Piekkari & Welch, 2010; Roth & Kostova, 2003). Much of the IB literature assumes managers are rational decision-makers who make decisions based on accurate perceptions of situational conditions that are considered systematically in an analytic rather than an intuitive way (Atuahene-Gima & Li, 2004; Ji & Dimitratos, 2013). In terms of the role of individual managers in such rational decision-making processes, managers tend to rely on an objective analysis of the situation and decision criteria, rather than their subjective preferences or orientations when reaching a decision on the final mode choice (Dean & Sharfman, 1993; Ji & Dimitratos, 2013). Despite emerging evidence about the significance of individual decision-makers, most existing studies research managerial perceptions of uncertainty without considering differences between individuals (e.g., Luo, 2001; White, Boddewyn, & Galang, 2015). This is problematic since the complete picture of international decision-making cannot be understood without a proper understanding of the motivations and attributes of managers at the individual level of analysis. Combining existing knowledge on uncertainty in IB with multilevel research and a greater emphasis on the individual illuminates many avenues to enhance our understanding about how decision-makers perceive the environment, make decisions based on their interpretations, and influence MNC performance (e.g., Maitland & Sammartino, 2015; Minbaeva, 2016).

Furthermore, one central limitation within existing research that cannot be resolved without understanding individual decision-makers is the conflicting findings and lack of consensus on MNC choices of uncertainty management approaches. Empirical studies illustrate that MNCs are more likely to choose a different cooperative/collaborative approach (e.g., a joint venture) than a controlling approach (e.g., a wholly owned subsidiary) when entering culturally distant countries (Brouthers & Brouthers, 2001). Other studies, however, find that greater cultural uncertainty increases an MNC's propensity to choose WOS (Tsang, 2005). Other studies present similar conflicting conclusions (e.g., Brouthers et al., 2008; Delios & Henisz, 2003a; Prater et al., 2001; Song, Lee, & Makhija, 2015; Li & Li, 2010; Sartor & Beamish, 2014).

This paper suggests that one way to explain and address these inconsistencies is to scrutinize the role of individual decision-makers in the MNC's choice of uncertainty management approaches. Recent studies observe that managers do not always define or react to uncertainty in ways that theoretical decision models would predict (e.g., Buckley et al., 2007; Forlani, Parthasarathy, & Keaveney, 2008). For instance, managers do not always think in terms of the probability of loss, but rather in terms of the magnitude of loss, and that is why their ways of managing uncertainty are more risky than firm-focused theories initially predict (Buckley et al., 2007). Furthermore, the

study by Richards and Yang (2007) did not find support for transaction cost logic holding that when environmental uncertainty is low, MNCs prefer to have entry modes involving higher resource commitments. In the same study, this is explained as MNCs making different equity ownership decisions in similar uncertain circumstances due to managers having different risk preferences that influence different transaction governance structures. Furthermore, managers from different national cultures are found to act differently, even in similar uncertain circumstances, due to their heterogeneous, subjective risk perceptions and risk preferences. The study by Haley (2003) found that managerial perceptions of environmental-, industry- and firm-related uncertainties have an effect on MNC decision-making. Acquiring a good understanding of the kinds of characteristics that influence managers' perceptions of uncertainty and what influences their approaches to managing it, would offer insights into the micro-foundations underlying MNC decision-making. MNCs' decisions are mediated by individual decision-makers, and the explanation of MNC decisions is therefore inherently a shorthand for a more complicated, micro-foundation-driven explanation (Coleman, 1990).

Future research in this domain could thus benefit from addressing the connections between the characteristics of the individual decision-maker and subjective perceptions about different dimensions of uncertainty (see dotted line in Figure 1). This could include the following questions: How do individual decision-makers manage perceived uncertainties? What influences the individual decision-maker's choice of uncertainty management approach? Are there any other characteristics of individual decision-makers not identified in this review that might be equally or more influential? Liesch et al. (2011, p. 868) offer even more specific research questions on this topic such as: "How does learning affect the individual manager's ability to make astute risk assessments and to accommodate risk? To what extent does this provide a robust explanation of successful international expansion trajectories and idiosyncratic internationalization behaviors?"

It is commonplace for most key MNC decisions (e.g., those on entry mode or internationalization expansions) to be made by organizational teams at MNC headquarters. Headquarters' decisions are indicators of the MNC's optimal interest. In most studies, both headquarters at the collective level and managers at the individual level are portrayed as rational decision-makers whose interests are aligned (Aharoni et al., 2011). Such perceptions over-simplify MNCs' decision-making processes and shift focus from the decision-making process to the outcome. Ignoring the process in this way may lead to misleading findings, since decision-makers daily face uncertainty arising from factors in the environment, industry, and firm (Buckley et al., 2007). Within an MNC, individual perceptions of foreign markets are likely to differ and there is no simple path from an individual's perception to the MNC's perception (Coleman, 1990; Felin & Hesterly, 2007; Foss, Husted, & Michailova, 2010; Gupta, Tesluk, & Taylor, 2007). Drawing on this multilevel perspective, it is important to understand the interconnections between the characteristics of individual decision-makers, their impact on a decision-making team's preference for uncertainty and how that manifests itself at the MNC level. An example question for future research in this regard could be: How do individual decision-makers' uncertainty management preferences influence MNC uncertainty management behavior at the team and firm levels? Piaskowska and Trojanowski (2014, p. 55) offer more specific future research questions: "How do executives' attributes, beyond their demographic characteristics such as age, tenure, education, experience or nationality, influence their top management team and international strategic decisions? What is the role of emotions, personalities, and values in these decisions?" In Figure 1, this research requirement is illustrated as a dotted arrow from the characteristics of the individual decision-maker to the decision-making team's uncertainty management approaches to MNC uncertainty management methods.

5. Conclusion

Uncertainty is currently the only constant faced by MNCs. Because it has a significant impact on the choices that MNCs make during their international decision-making, uncertainty is an important phenomenon to study. This study has described various dimensions of environmental, industry and firm uncertainty faced by MNCs and the approaches to uncertainty reduction and coping

they use to manage such uncertainty. Through the evidence of its systematic literature review, this paper has brought awareness that uncertainty is conceptualized and measured inconsistently in the IB literature and this is problematic because it leads to fragmented and conflicting findings about MNCs' behavior and decision-making. Accordingly, this paper has offered an integrative framework that organizes and synthesizes dimensions of uncertainty into modified and detailed categorizations that are relevant for the IB audience. This framework encourages a more consistent use of uncertainty dimensions and integration of a wider spectrum of different kinds of uncertainties within single studies.

Furthermore, this paper has also revealed that in situations where MNC behavior deviates from that predicted by theoretical models, the role of those individual decision-makers who determine the uncertainty management approaches used by an MNC becomes influential. Reflecting on systematic review findings, this paper has identified five integrating characteristics of the key individual decision-makers: previous decision-making experience, tolerance for ambiguity, individualistic/collectivistic orientation, position in the organizational hierarchy, decision-making orientation. Understanding the impact of individual decision-makers and their characteristics on MNCs' choice of uncertainty management approach is important because it would add significantly to the predictive validity of theoretical models.

Lastly, the paper has offered an agenda for future research discussing three critical suggestions. In the first place, to achieve more conceptually and statistically parsimonious dimensions of uncertainty, future research should conduct more studies on the generalizability of different constructs of uncertainty across industries and countries and integrate subjective measures of uncertainty. In the second suggestion, future research should integrate a wider spectrum of uncertainties within single studies. By including several dimensions of uncertainty within a single study and considering firm dimensions of uncertainty along with environmental and industry uncertainties, international decision-making models will be supplemented with a greater variation of MNC behavior under the contextual effect of multiple uncertainties on MNC operations. The third suggestion puts forward the notion of individual managers' perceptions of uncertainty and their choice of uncertainty management approaches. Understanding the characteristics that influence managers' perceptions of uncertainty and the methods available to manage it would in turn advance our understanding of the micro-foundations underlying MNC decision-making.

Collectively, it is hoped that this systematic review of the literature and these suggestions for future research serve to enrich this significant stream of IB research.

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Notes

1. Summary of the selected and reviewed articles is available from the author upon request.
2. The year when the difference between uncertainty and risk was defined for the first time by Knight (1921).
3. The selected synonyms for "uncertainty" were "complexity", "ambiguity", "risk", "dynamism", "high-velocity", "instability", and "equivocality". These synonyms of uncertainty were identified based on both the theoretical conceptualization of uncertainty in the work of Lipshitz and Strauss (1997), which is one of the most inclusive among existing conceptualizations of uncertainty, and consultation with an information specialist in the field of business studies.
4. Other alternative classifications of uncertainty are described in Root (1987), Das and Teng (1999, 2001)), and Burgers and Padgett (2009). Miller's (1992) classification of uncertainty, however, remains the most applicable to the context of this paper since it is the most comprehensive in the IB field.
5. Miller's (1992) uncertainty management framework consists of two uncertainty management methods and seven relevant approaches. Simangunsong et al.'s (2012) uncertainty management framework consists of two uncertainty management methods and 21 relevant approaches.
6. Simangunsong et al. (2012) offer three types of flexibility as separate approaches. To keep the list of approaches simple, this paper uses one term of

flexibility for its different forms. Similar simplification is observed in Miller's (1992) article.

7. Miller (1992) uses the term cooperation, while Simangunsong et al. (2012) uses collaboration. Since the reviewed IB literature uses these two terms interchangeably, this paper terms this approach as collaboration/cooperation (C3).
8. Instead of avoidance Simangunsong et al. (2012) refer to postponement, although the concept of the term is the same in both frameworks: i.e., postpone or avoid the decision until the last possible moment in order for the situation to become more known. The reviewed IB literature uses the term avoidance more frequently than postponement. Thus, this paper integrates the term avoidance.

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