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Wicked problems, reductive tendency, and the formation of (non-) opportunity beliefs

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Executive summary

Wicked problems persistently cause human suffering, endanger wildlife, and degrade the environment, and are defined by their inherent complex, uncertain, and evaluative nature. Because of these interrelated and mutually reinforcing characteristics, they are notoriously difficult to solve. We explain how the nature of wicked problems affects the way in which beliefs about opportunities to solve them are formed, and why these beliefs often prevent prospective entrepreneurs from correctly judging not only the feasibility of acting on them, but whether such an opportunity exists at all. Drawing on this research context we also help explain how unfounded entrepreneurial opportunity beliefs are formed more broadly. That is, prospective entrepreneurs making the Type I error of falsely identifying an opportunity when there is none.

We draw on the 'reductive tendency', a process through which individuals simplify complex systems into cognitively manageable representations. While simplified representations offer benefits, such as quicker decision-making, such representations are often inaccurate as they overlook the complexities of the problem at hand. We argue that the reductive tendency can make wicked problems appear easier to solve than they are in reality, leading to the formation of what we call non-opportunity beliefs; the conviction that one can solve a problem, when in fact the objective conditions required to do so are absent. We further argue that prior experiential knowledge makes an entrepreneur less susceptible to the reductive tendency and, consequentially, less likely to form a non-opportunity belief.

Our work offers contributions to both theory and practice. We extend the critical realist perspective on non-opportunities by explicating the mechanisms through which non-opportunity beliefs are formed. We further introduce and conceptualize *problem uncertainty* as a specific form of state uncertainty where the exact definition, boundary conditions, and causes of a problem are unknown or unknowable. This offers a more focused conceptualization of the uncertainty inherent to wicked problems that also specifically identifies problems as the starting point of *all* entrepreneurial opportunity. Our theorizing is also of practical importance since, in the context of socially/environmentally focused entrepreneurship, ill-conceived attempts to address wicked problems can have serious negative consequences for people and ecosystems that are already among the most vulnerable. By highlighting the susceptibility of entrepreneurs to the reductive tendency, we expand awareness of an avoidable and consequential pitfall in the entrepreneurship process. We further offer a means of circumventing the reductive tendency – through the acquisition of pertinent knowledge.

1. Introduction

There is growing interest in the role entrepreneurs can and should play in addressing the world's most difficult social and

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environmental challenges (Saebi et al., 2019). Problems such as generational poverty, climate change, and terrorism are both persistent and difficult to solve, in part because they are "wicked". Wicked problems, commonly linked to society's grand challenges, are characterized by their complex, uncertain, and evaluative nature (Ferraro et al., 2015; Reinecke and Ansari, 2016). Interestingly, identifying these long-standing, widespread, and highly publicized problems and many of their negative effects is easy; yet understanding their definitions, boundary conditions, and causes is not (Dentoni et al., 2016; Farrell and Hooker, 2013; Gioia, 1992; Rittel and Webber, 1973).

Prior literature on the entrepreneurs that engage with these types of problems has focused on the prosocial motivation that drives them (e.g., Conger, 2012; Mair and Noboa, 2006; Miller et al., 2012; Thompson et al., 2000; Waddock and Steckler, 2016; Wry and York, 2017). However, we know relatively little about how they form the belief that there is an opportunity to solve these seemingly intractable problems, often with little or no evidence to suggest such an opportunity exists. Despite a bias in the literature and popular press toward lionizing the heroic social entrepreneur (Nicholls, 2010), examples of incredible naïveté and seemingly needless failure on the part of well-meaning entrepreneurs are common (Bornstein, 2013; Starr, 2016). One of the foundational arguments in our field is that entrepreneurial opportunities disrupt the status quo (Schumpeter, 1934). As a result, our focus as a field has long been on why a relatively small group of individuals act on opportunities while others do not (Venkataraman, 1997); that is, explaining why entrepreneurs are able to identify opportunities while most of us fail to do so, essentially committing a Type II error.

Rarely do we consider how and why unfounded entrepreneurial opportunity beliefs (which we also refer to as non-opportunity beliefs) are formed. That is, prospective entrepreneurs making the Type I error of falsely identifying an opportunity when there is none (for exceptions see: McMullen and Dimov, 2013; Ramoglou and Tsang, 2016). In the context of socially/environmentally focused entrepreneurship, this is also of practical importance since ill-conceived attempts to address wicked problems can have serious negative consequences for people and ecosystems that are already among the most vulnerable (Khan et al., 2007). Khan et al. (2007) offer a poignant example of this occurrence by demonstrating how attempts to eliminate child labor in the production of soccer balls led to a drastic decrease in female workforce participation and increase in poverty among Pakistani communities.

The purpose of this paper is to therefore explain how the nature of wicked problems affects the way in which beliefs about opportunities to solve them are formed, and why these beliefs often prevent prospective entrepreneurs from correctly judging not only the feasibility of acting on them, but whether such an opportunity exists at all. To explain why prospective entrepreneurs make Type I errors we draw from the literature on the reductive tendency, which has its roots in education and psychology research (Coulson et al., 1989; Feltovich et al., 2004). The reductive tendency is a process through which individuals learning about and interpreting complex phenomena overly simplify their understandings of it (Coulson et al., 1989; Hmelo-Silver and Pfeffer, 2004). We propose it is this over-simplification that can result in Type I errors.

Our theorizing has implications for the literatures on entrepreneurial opportunities, knowledge, social entrepreneurship, and the entrepreneurship literature more broadly. With wicked problems as a backdrop, we bring a new focus to problems as the basis for opportunity. We introduce and conceptualize problem uncertainty as a specific form of state uncertainty and, drawing on this conceptualization and the reductive tendency, develop mechanisms that explain the formation of beliefs based on non-opportunities. Through the development of these mechanisms, we advance the extant dialogue and theorizing on opportunity belief formation. An outcome of our theorizing is an explanation of why many social entrepreneurs addressing wicked problems fail to achieve their aspirations.

2. Wicked problems and (non-)opportunity

McMullen argues that "Opportunities consist of environmental conditions (situations) that are interpreted as opportunities when those conditions allow advancement of goals." (Mcmullen, 2015:659). Applying a realist perspective on opportunity to this definition (Ramoglou and Tsang, 2016), we view entrepreneurial opportunities as the propensity of goals to be actualized into desired outcomes through entrepreneurial action. In this view, propensities exist independently of potential entrepreneurs (Ramoglou and Tsang, 2016). Within the traditional, for-profit literature, propensities generally take the form of "unmet or possible market demand that can be actualized into profits" (Ramoglou and Tsang: 413). For the purposes of our theorizing, we focus specifically on opportunities for which the goal is to alleviate the suffering and damage caused by wicked social and environmental problems (Dorado and Ventresca, 2013).[2] We focus on how individuals form the belief that, by acting entrepreneurially, they can alleviate these problems and why they do so even when no viable opportunity to do so exists.

Wicked problems persistently cause human suffering, endanger wildlife, and degrade the environment. They are notoriously difficult to solve because of interrelated and mutually reinforcing characteristics that they all share (Rittel and Webber, 1973). Ferraro and his colleagues distill these characteristics into three dimensions, saying wicked problems are: complex, uncertain, and evaluative (Ferraro et al., 2015). The complexity of wicked problems stems from their systemic, interconnected, and non-linear nature. They involve dysfunction at the institutional or network level (Dorado and Ventresca, 2013; Sterman, 2001) and frequently span national, social, and industry boundaries (Reinecke and Ansari, 2016). This makes understanding their relationship to the work of individual actors extremely difficult (Farrell and Hooker, 2013; Sterman, 2001; Waddock, 2008). Furthermore, understanding how a wicked problem may manifest in one locale, culture, or social situation versus another is problematic given the presence of different

[2] Wicked problems are not a prerequisite for the presence of social entrepreneurship; instead this is a boundary condition of our theorizing. Definitional debates abound in the social entrepreneurship literature (Dacin et al., 2010; Short et al., 2009). We acknowledge that many kinds of opportunities to affect positive change are possible.

institutions, networks, and cultural differences. Wicked problems also tend to be entangled with other systemic problems that are themselves made up of multiple, interconnected problems (Gioia, 1992; Reinecke and Ansari, 2016; Rittel and Webber, 1973). Compounding these factors is the nonlinear nature of wicked problems, where "cause and effect relationships are either unknown or highly uncertain" (Dentoni et al., 2016:36). For example, a social entrepreneur trying to break cycles of generational poverty in U.S. rust belt cities through education or job creation would begin to uncover a web of other causal factors, such as unresolved issues of race and class, as well as ambiguity around the impact that changing one factor would have on the others, or on generational poverty as a whole. Taken together, these factors contribute to a deep complexity that makes it difficult to either identify the root causes of wicked problems or to break them down to the level where the efficacy of individual action can be imagined. Likewise, identifying both the boundary conditions of wicked problems and the relationships between their facets is exceptionally difficult, as is tracing their causes or predicting the likely outcomes of possible remedies.

Second, wicked problems present potential entrepreneurs with "radical" uncertainty (Ferraro et al., 2015:364). Because of their specifically nonlinear and interrelated complexity, wicked problems "have no closed form definition" (Dentoni et al., 2016:36). Ironically, the 'answers' to wicked problems and the potential future value in solving them fundamentally are known (Rayner, 2006; Rittel and Webber, 1973). For example, it is 'obvious' that people experiencing food insecurity need adequate access to healthy food. It is the near impossibility of understanding the problem itself—that is, the full breadth of the causal mechanisms, boundaries, and web of interrelated problems that define food insecurity—that make pursuing this 'obvious' opportunity highly uncertain, and indeed, call into question whether such an opportunity exists at all. This is compounded by the high stakes and often irreversible consequences of attempts to solve wicked problems that are often "one-shot operations" for which "every attempt to reverse a decision to correct for the undesired consequences poses another set of wicked problems, which are in turn subject to the same dilemmas." (Rittel and Webber, 1973:163).

Third, the complexity and uncertainty of wicked problems are further complicated by their evaluative nature. Wicked problems concern myriad of individuals and groups within society with different understandings of what success means, making it challenging to identify a uniform understanding of how to address wicked problems and what a successful outcome entails. It is, therefore, unsurprising that "human values and norms can become inextricably intertwined with [wicked] problem formulation and problem resolution" (Farrell and Hooker, 2013:686). With "no immediate and no ultimate test" of any possible solution to a wicked problem, consensus about its efficacy and appropriateness is extremely unlikely (Rittel and Webber, 1973:139). For example, passing legislation to hamper child labor in developing countries is simultaneously celebrated by those who see the practice as deplorable and denounced by others who believe it will prevent children and families from sustaining themselves; each group having conflicting arguments on the virtue and true costs of the practice (cf. Khan et al., 2007). In some cases, solutions to wicked problems are even deemed to be worse than symptoms of the initial problem (Churchman, 1967; Dorado and Ventresca, 2013). In sum, the evaluative nature of wicked problems virtually assures that understanding their causes, relationships to other problems and phenomena, and potential solutions that compound their complexity and uncertainty are complicated. Together, the complex, uncertain, and evaluative nature of wicked problems means that they are extremely difficult to understand, at least at face value.

Due in part to this nature of wicked problems, our contention is that the propensity for entrepreneurs to identify appropriate opportunities to solve wicked problems is lower than popular narratives about heroic social entrepreneurs imply. In arguing this, we align with a realist perspective (Mole, 2011; Mole and Mole, 2010; Ramoglou, 2013a, 2013b; Ramoglou and Tsang, 2016; Ramoglou and Zyglidopoulos, 2015) which holds that, while the realization of opportunities requires entrepreneurial actors, "…the existence of entrepreneurial opportunities remains independent of the thoughts, imagination, or actions of any given entrepreneur, entrepreneurial team, or entrepreneurial organization" (Ramoglou and Tsang, 2016:419). The essential idea here underpinning our arguments is that, in addition to the prospective entrepreneur's desire to solve wicked problems and willingness to act, objective conditions that make solving them possible must be in place for an opportunity to exist.[3] Ramoglou and Tsang (2016) argue that the absence of these conditions characterizes the domain of non-opportunity, likening it to toiling over soil where no seeds exist. These objective limitations may apply to all prospective entrepreneurs (e.g., no cure for AIDS currently exists) or may be specific to an individual (e.g., needed drugs are patented by another company). We argue that, because of the factors we outline above (e.g., institutional voids; complications related to social, cultural, and geopolitical boundaries; conflict over the value and appropriateness of possible solutions; etc.), the objective conditions necessary for opportunity within the domain of wicked problems may be missing. Moreover, because the definition, boundary conditions, and causes of wicked problems are so difficult to understand, the risk of individual actors misjudging the presence or absence of these conditions is quite high. To be clear, we are not implying that it is impossible to solve wicked problems. Instead, we argue that many prospective entrepreneurs in this context make Type I errors, forming beliefs about opportunities to solve wicked problems where, in fact, no opportunity exists. In the remainder of this paper, we draw from literature on opportunity beliefs, non-opportunity, and reductive tendency to explain why formation of these non-opportunity beliefs occurs. Our theoretical model is illustrated in Fig. 1.

[3] Importantly, Ramoglou and Tsang define opportunities not as empirical entities but as propensities (Ramoglou and Tsang, 2016, 2018). While scholars espousing the "discovery" view of opportunity disagree with this ontological perspective, they do espouse similar ideas on this topic. Per Davidsson's conceptualization of "external enablers", for example, also recognizes the essential role of objective conditions in making entrepreneurial action possible (Davidsson, 2015).

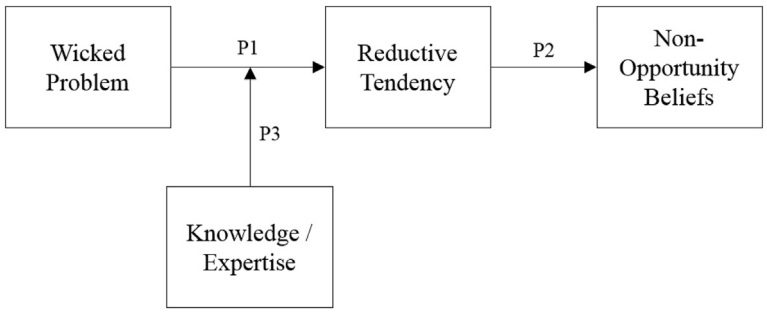

Fig. 1. Non-opportunity belief formation in the context of wicked problems.

3. The reductive tendency

To explain how prospective entrepreneurs form the sometimes-mistaken belief they have an opportunity to solve wicked problems, we turn first to the reductive tendency which provides insights into how individuals understand complex problems. The reductive tendency is a process through which individuals simplify complex systems into cognitively manageable representations (Feltovich et al., 2004). Research on the reductive tendency is generally conducted using cognitive flexibility theory, which focuses on the nature of learning in complex and ill-structured domains (Rhodes and Rozell, 2017; Spiro and Jehng, 1990). Research on the theory is largely concerned with how information is presented to accommodate and produce cognitive flexibility. Yet, some scholars working in this area focus on the reasons why concepts are complex and the systematic ways in which learners misunderstand them (e.g., Feltovich et al., 2004; Hmelo-Silver and Pfeffer, 2004).

The reductive tendency has been supported in research on education, comprehension, and cognition in fields such as biomedicine (Coulson et al., 1989), law (Feltovich et al., 1995), physics (McCloskey, 1983; Clement, 1982), climatology (Collins and Gentner, 1983), and engineering (Feltovich et al., 2004). These scholars have identified a common tendency to over-simplify complex concepts, despite there being significant costs to the misconstruing of complexities (e.g., heart surgeries; murder trials). They have concluded that many misconceptions concern commonly held mental processes through which learners accept an overly simplified understanding. For example, when faced with complex concepts, individuals are often inclined to treat dynamic concepts as static, or to generalize across dissimilar domains (Feltovich et al., 1995).

Multiple reasons have been offered as to why reduction is so common. For example, the ability to reason about complexity requires a range of components to be prioritized to understand how they relate within a system. As this is difficult, individuals adopt understandings that are simpler in nature, thereby reducing the perceived complexity of a problem (Feltovich, Spiro, and Coulson, 1993). Others suggest that the tendency is a habitual carry-over from the rudimentary and routinized way that beginners are introduced to a concept (Gibson and Spelke, 1983). For many individuals, simpler conceptual forms are often employed to introduce a topic (Feltovich et al., 1989). This may, however, set up path-dependent learning that relies on reduction as a crutch (Feltovich et al., 1986). Another argument arises from motivational psychology and the finding that people prefer a middle level of complexity in their lives; concepts that are too simple are deemed boring, while concepts that are too complex are off-putting and do not attract engagement (Berlyne, 1971).

Research has identified 11 dimensions or manifestations of the reductive tendency (Feltovich et al., 2004; Hmelo-Silver and Pfeffer, 2004). We organize these into three categories. The first pertains to simplifying processes and entails four dimensions: continuous processes are simplified into ones with discrete steps; interactive processes that depend on each other are simplified to be independent and separated; concurrent processes are simplified to be sequential; and nonlinear explanatory relationships are simplified into linear ones. The second category pertains to perspective restrictions. This category describes situations in which individuals minimize the importance of, or ignore altogether, facets or manifestations of phenomena. This category includes three dimensions whereby individuals simplify: concepts necessitating multiple representations to single ones; phenomena with numerous and ambiguous causal mechanisms to ones with simple and clear causal agents, and; concepts with covert or abstract elements to surface-level, apparent ones. The third category contains four dimensions that pertain to forming standardized representations of phenomena. It captures situations in which individuals simplify: concepts necessitating dynamic understanding of inputs into static ones; heterogeneous schemes or facets of a phenomena into uniform or highly similar; context-sensitive phenomena into universal ones; and regularity to replace situations that are characterized by asymmetric, inconsistent, or complex patterns. Table 1 presents each of the three categories and 11 dimensions, explains each dimension, exemplifies a wicked problem to which the dimension may pertain, references a paper that demonstrates the dimension (even if they employed different theories to express them), and provides two examples of social entrepreneurship (or highly related, e.g., social innovation) studies for each of the three categories.

The reductive tendency literature is clear: not all individuals succumb to oversimplification via one or more of these dimensions. Those with a great degree of cognitive flexibility, for example, may comprehend complex phenomena. Likewise, we suggest that not all prospective entrepreneurs will succumb to the reductive tendency in the face of wicked problems. However, wicked problems create scenarios in which prospective entrepreneurs are inclined to mentally create and accept a reductive understanding of the problem. Our rationale is that the very things that make wicked problems, wicked - that they are complex, uncertain, and evaluative - are the same things that facilitate the reductive tendency. A cornerstone of the reductive tendency literature is that complexity

Table 1
The 11 dimensions of reductive tendency.

Dimension	Summary	Ex. of WP complexity	Ex. study[a]
Simplification of process dimensions			
1. Discrete vs. continuous	*A continuous process is more complex than one that can be broken up into clear, discrete steps.*	The fluid and iterative nature of developing and passing new laws makes legal activism difficult and unpredictable.	Fiore et al. (2008)
2. Separable vs. interactive	*Independent processes are easier to understand than those that are more interrelated.*	By providing free goods or services to the impoverished, local industry may be crowded out, creating more poverty in the long-term.	Biltz (2006)
3. Sequential vs. simultaneous	*Simultaneous processes are more difficult to grasp than those that unfold in a step-by-step order.*	Ex-convicts transitioning back into society often have diverse, yet immediate and concurrent needs from the moment they are released, such as housing, employment and psychological support.	Mitchell et al. (1999)
4. Linear vs. nonlinear	*A clearly lineated set of relationships between processes is easier to understand than ones with delineated, overlapping processes.*	While setting up a water well may be a linear process, maintaining them in perpetuity involves intermittent, difficult to predict, attention and resources.	Rogers (2000)
Examples of simplification of process in SE and related studies – Hall et al. (2012); Lane et al. (2009)			
Perspective restriction dimensions			
5. Single vs. multiple representations	*Concepts that can be presented through a single exemplar are easier to understand than those necessitating multiple depictions.*	The homeless are a heterogeneous population with numerous and varying needs. Helping one is often different from helping another for SEs.	Burstein and Adelson (1990)
6. Mechanism vs. organicism	*Processes with one or few causal agents are less complex than those with many.*	Poverty is often not the result of a lack of local high paying jobs. Instead, factors such as a lack of skillsets, financial institutions, and health deficiencies, hamper wealth accumulation.	Hoffman et al. (2014)
7. Surface vs. deep	*The ability to grasp a concept through easily observable content makes it simpler than one that necessitates the uncovering of covert or abstract elements.*	Mental health issues are difficult to diagnose simply by the observable actions of patients. Instead, they possess deep-seated root causes that must be uncovered through time, effort, and skill.	Valley et al. (2018)
Examples of perspective restriction in SE and related studies – Cook et al. (2003); Roy et al. (2014)			
Standardized representation of phenomena dimensions			
8. Static vs. dynamic	*The more a concept changes over time, the more complex.*	The sheer volume of medical research and pace of advances makes it cumbersome for even health professionals to stay abreast.	Meyers et al. (1990)
9. Homogeneous vs. heterogeneous	*Similar facets of a process better facilitates understanding of the whole.*	Efficient and effective foreign aid faces a plethora of dissimilar challenges, such as local corruption, poor infrastructure, misidentified needs, and donor politics.	Wiser and Carey (1983)
10. Universal vs. conditional	*Concepts that hold and apply under varying circumstances are less complex than ones that vary with circumstances.*	Entrepreneurs in the base of the economic pyramid need idiosyncratic support based on varying levels of education, experience, and financial needs.	Tobin (2013)
11. Regular vs. irregular	*A typical, repeatable concept is less complex than one that is atypical, and/or inconsistent.*	The irregularity and unique manifestations of many crimes around the globe makes prevention a challenging task.	Spiro et al. (2012)
Examples of standardized representation of phenomena in SE and related studies – Rutherford (2000); Ika and Donnelly (2017)			

[a] This is a domain-diverse collection of studies that, whether or not they employ the specific dimension terminology, employ the dimension itself.

substantially burdens the working memory and mental capacity of the individual (Graesser, 1999; Narayanan and Hegarty, 1998). Understanding a complex system necessitates constructing a network of concepts and principles about a domain that represents key facets and the interrelationships among macro and micro structures of the system (Hmelo-Silver and Pfeffer, 2004). This provides incentive for individuals to formulate a simpler conception of a phenomenon, in order to reduce the mental burden. Regarding uncertainty, the reductive tendency literature demonstrates that learners are averse to concepts with which they are highly unfamiliar (Jacobson, 2001; Resnick and Wilensky, 1998). Reapplying concepts one knows well is predictable, comforting, and less mentally taxing, whereas pondering the multitude of potential outcomes through probabilistic, stochastic, or other methods offer discomfort and mental hardships (Jacobson, 2001). Thus, many individuals fall back on generating an understanding of the problem that adheres to simple concepts related to previously and easily garnered knowledge. Regarding the evaluative nature of wicked problems, the reductive tendency literature finds that ill-structured domains are conducive to the reductive tendency. Ill-structured domains are those in which applying knowledge varies significantly, and any given case is atypical (Spiro et al., 1995). In essence, applying knowledge is challenging in ill-structured environments, thus necessitating idiosyncratic evaluations and solutions (Feltovich et al., 1995).

The widely acknowledged failure of PlayPumps International (Kim and Perreault-Henry, 2018a, 2018b) provides a rich illustration of the reductive tendency in the context of a wicked problem, access to clean water. PlayPumps manufactured a water pump that doubled as a children's merry-go-round. PlayPumps attracted high-profile investors including $16.4 million from a US public-private partnership (Pump Industry Analyst, 2006). The idea was simple: as children played they would also be pumping underground water to the surface. However, the organization faced a number of obstacles that were not adequately considered by its founder, including, among others: scarcity of underground water; underestimating the volume of water that could be pumped by

children through play; underestimating the cost of installation; a shortage of suitable sites for installation; conflicts occurring between community members and schools; a lack of interest from potential billboard advertisers, which would fund pump maintenance; differing local conditions creating the need for design changes; and difficulty finding qualified and reliable locals to install and maintain the pumps (Kim and Perreault-Henry, 2018a, 2018b). The situation was aptly articulated by Daniel Stellar, who writes for the Earth Institute at Columbia University:

> The failure of PlayPump[s] points to a huge problem in meeting water challenges — simply put, there is no panacea. Water problems are very complex and come in a multitude of flavors. In some very specific situations, PlayPump[s] may be the right type of solution. In most situations though, it is imperative to first really understand the problem and to then design appropriate, tailored solutions. (Stellar, 2010: 1).

Based on our arguments, we offer our first proposition:

P1. Prospective entrepreneurs engaging with wicked problems are susceptible to the reductive tendency because of the complex, uncertain, and evaluative nature of such problems.

We next explain how the reductive tendency can lead to non-opportunity beliefs — the unfounded conviction that an opportunity exists — in the context of wicked problems. We also introduce in this section the concept of problem uncertainty and show how, through this particular form of state uncertainty, the reductive tendency puts prospective entrepreneurs at risk of forming non-opportunity beliefs.

4. Forming non-opportunity beliefs to solve wicked problems

Dominant conceptualizations of opportunity beliefs (i.e., belief that acting on an opportunity will result in a desired end state, such as generating profit or benefiting society [Wood et al., 2014]) focus on how uncertainty determines whether action and effort will produce the desired results (Ramoglou and Tsang, 2016). For example, McMullen and Shepherd (2006) focus on the role of doubt – uncertainty resulting from not knowing whether acting on the opportunity will lead to a desired end state, and the need for individuals to overcome this doubt in order for them to act. Following Milliken (1987), they classify uncertainty as addressing three broad questions "(1) What's happening out there? (state uncertainty), (2) How will it impact me? (effect uncertainty), and (3) What am I going to do about it? (response uncertainty)" (McMullen and Shepherd, 2006:135). They suggest that, inasmuch as it is linked to action (or the inhibition thereof), distinguishing between types of uncertainty is relatively unimportant. All uncertainty, they argue, fuels doubt related to knowledge (affecting perceptions of the degree of uncertainty) or motivation (affecting willingness to bear that uncertainty) inhibiting opportunity beliefs and, subsequently, action to pursue opportunity.

However, as we have shown, prospective entrepreneurs can and often do incorrectly judge the conditions underlying wicked problems. To understand how these errors in judgment may lead to Type I errors — non-opportunity beliefs — we return to Milliken's classification and reconceptualize the type of uncertainty that these individuals tend to misperceive. Because of their complex, uncertain, and evaluative properties, wicked problems present a specific kind of state uncertainty related to the unknowable nature of the problem itself, which we conceptualize as *problem uncertainty*. The wicked problems literature touches on this type of uncertainty, yet it remains undertheorized. Dietz et al., (2003) refer to it as "the inherent unpredictability in the systems" (p. 1908) while Ferraro and his colleagues refer to it in their discussion of the complexity of wicked problems as, "many facts are known, but these facts alone are not sufficient to provide a definitive basis for taking action" (2015:366). These definitions seek to describe a broad and pervasive Knightian uncertainty in which "Actors cannot even enumerate what the possible future states of the worlds may be, let alone assign probabilities to them" (Ferraro et al., 2015:366). However, because of the future-oriented outcome focus of Knightian uncertainty, the wicked problems literature stops short of explicitly conceptualizing the immediate state uncertainty inherent in wicked problems. Formally, we conceptualize *problem uncertainty* as a specific form of state uncertainty where the exact definition, boundary conditions, and causes of a problem are unknown or unknowable. This offers a more focused conceptualization of the uncertainty inherent in wicked problems that also specifically identifies problems as the starting point of entrepreneurial opportunity.

Problem uncertainty directly influences how an actor understands the objective conditions required for an opportunity to be actualized and their judgment about the extent to which these conditions are present. In effect, problem uncertainty reshapes the "What's happening out there?" question with a problem-specific orientation "What problems are out there and what is causing them?". While the desired outcomes of solving a wicked problem are easy to identify, its exact definition, boundary conditions, and causes are not. This underlies our theorizing by explaining firstly how the nature of wicked problems affects the way in which beliefs about opportunities to solve them are formed. It also explains why these beliefs often prevent the entrepreneur from correctly judging not only the feasibility of acting on these beliefs, but also whether such an opportunity exists at all.

We have suggested that, while wicked problems are easy to identify, their exact definition, boundary conditions, and causes are not, thus creating a situation where prospective entrepreneurs are susceptible to the reductive tendency [Proposition 1]. The resulting simplification of wicked problems occurs by people misidentifying and failing to appreciate problem uncertainty such that it may be unduly (albeit inadvertently) ignored. When this is the case, entrepreneurs may fail to recognize the nature and magnitude of problem uncertainty. Consequently, it becomes impossible not only to know whether the conditions to sustain a venture to address the problem are present, but also to judge the existence of an opportunity to solve the problem in light of those conditions. To explain the mechanism by which this breakdown in judgment ability occurs (and non-opportunity beliefs are formed), we again draw on a realist argument about how the existence of opportunities (i.e., their propensity to be actualized) can be understood.

Ramoglou and Tsang suggest there are three "fundamental modes for making cognitive contact with possibly real yet empirically

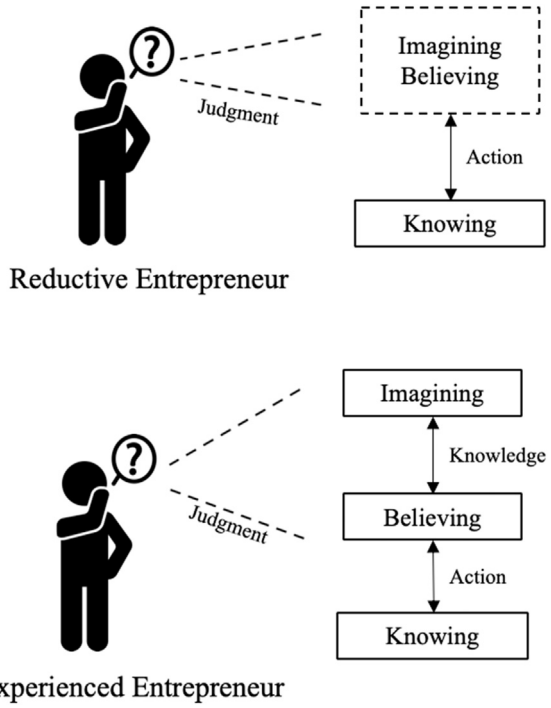

Fig. 2. The effects of reductive tendency and knowledge on entrepreneurial judgment.

unactualized propensities: imagining, believing, and knowing" (2016:411). The distinction between the first two modes, what can be imagined by prospective entrepreneurs and what they believe, is the belief that what is being imagined can also be real. It is possible to imagine many outcomes without the accompanying belief that what is being imagined is also genuinely possible (Ramoglou and Tsang, 2016). For example, while it is easy to fantasize about potential ideas and their grandeur, we typically also realize the limitations to what is possible. Imagination is insufficient for offering the experience one has when believing one has identified as an opportunity. One must additionally trust that the imaginative projection corresponds to a naturally possible world state.

The means of making these determinations is the prospective entrepreneur's judgment or the window through which he or she "sees" the opportunity (Ramoglou and Tsang, 2016:424). It provides the final way to understand how non-opportunity beliefs about solving wicked problems are formed. As prospective entrepreneurs consider what is imagined and what is possible, they make sense of the objective conditions surrounding potential opportunities. However, as we have shown, the nature of wicked problems affects both the propensity that an opportunity can be possible and the likelihood that prospective entrepreneurs will unduly simplify their understanding of the problem due to the reductive tendency. This simplification manifests as a narrowing or even eliminating the entrepreneur's ability to distinguish between imagining and believing. In this way, the entrepreneur's modes of imagining and believing collapse, as they cannot accurately judge the objective conditions required to sustain a venture. By simplifying the wicked problem, they risk believing what they imagine can also be real, thus increasing the likelihood of forming a belief based on a non-opportunity. Fig. 2 depicts the reductive entrepreneur's situation.

Having explained the mechanism by which the reductive tendency affects the prospective entrepreneur's judgment to shape non-opportunity beliefs, we offer our second proposition:

P2. The reductive tendency results in the simplification of wicked problems, increasing the likelihood that prospective entrepreneurs form non-opportunity beliefs.

We argue that, because an individual simplifies understandings of wicked problems, he or she more easily imagines "a favorable state of the world to follow a course of action" (Ramoglou and Tsang, 2016:424). This makes it difficult for prospective entrepreneurs to distinguish between what should be left to imagination and what is possible, resulting in the potential formation non-opportunity beliefs.

However, not all prospective entrepreneurs tackling wicked problems fall prey to the reductive tendency and form beliefs based on non-opportunities. We focus on the role of knowledge in mitigating the manifestation of the reductive tendency and the implications this has for belief formation. We suggest that knowledge both enables prospective entrepreneurs to understand the complex, uncertain and, evaluative nature of wicked problems, reducing the likelihood they inadvertently simplify them, while also expanding the domain of what is possible. Regarding the latter, it is important to remember the objective existence of opportunities and the role that contextual factors play in constraining what is an opportunity for some prospective entrepreneurs. Depending on context, an opportunity for one entrepreneur could be a non-opportunity for others (McMullen and Shepherd, 2006). Knowledge, or more precisely the lack of it, is one such factor which can constrain what is possible for an entrepreneur.

As we are interested in explaining the formation of non-opportunity beliefs, our focus on knowledge centers on its role in distinguishing between imagining and believing, rather than the distinction between the latter two modes of Ramoglou and Tsang's typology: believing and knowing. The difference between an opportunity belief and knowing an opportunity is genuine can only happen retrospectively, after action to actualize the opportunity has been taken (McMullen, 2015). While this distinction is possible to make after the results of entrepreneurial action unfold, it is not possible to know whether a yet-to-be actualized opportunity is a non-opportunity or an opportunity waiting for the right entrepreneur to actualize it. This reflects the actor-intensive nature of opportunities. Like all entrepreneurship, action is required. Even if a viable opportunity belief is formed, success is far from guaranteed.

5. Knowledge, the reductive tendency and the formation of opportunity beliefs

Not all individuals construct overly simplistic understandings when faced with complex problems (Jacobson, 2001). Expertise with a complex problem reduces the extent to which an individual is susceptible to the reductive tendency as their knowledge of the problem enables them to comprehend its complexity (Feltovich et al., 2004; Jacobson, 2001). In this vein, novices learning about a complex concept for the first time prefer simple causality, central control, and predictability in the phenomena they encounter (Jacobson, 2001). Experts, conversely, demonstrate decentralized thinking, an understanding of multiple causes, and the use of stochastic and equilibration processes (Jacobson, 2001).

Research in other domains, including psychology (Jacobson, 2001), entrepreneurship (Shane, 2000), and education (Hmelo-Silver and Pfeffer, 2004), provides theoretical backing and empirical evidence that prior knowledge facilitates further and more complex knowledge acquisition. Such prior stores of knowledge allow individuals to accumulate and integrate new information (Gimeno et al., 1997), to focus on the more salient facets of a concept (Shepherd and Patzelt, 2018), and to identify new means-ends relationships or entrepreneurial opportunities (Davidsson and Honig, 2003). These effects are salient for understanding how prospective entrepreneurs learn about wicked problems as their nature is revealed through experience with them. For example, experience with wicked problems, and the knowledge gained through it, may reveal to prospective entrepreneurs their multiple-facets and non-obvious root causes (Rittel and Webber, 1973).

We suggest three ways in which a prospective entrepreneur can learn about the nature of wicked problems. First, this knowledge can stem from personally experiencing the problem (Goss et al., 2011; Waddock and Steckler, 2016). Goss et al. (2011) found that personal experience enables entrepreneurs to understand multiple facets of a wicked problem and draw on this knowledge when establishing their own social enterprises. For example, Prison Fellowship International, an organization that helps inmates transition back into society after their release, among several other program offerings, was founded by a former prisoner. Having personally experienced the hardships of prison and carrying those hardships after release, the founder understood the challenges prisoners face and was motivated to form an enterprise to help them (Prison Fellowship International, 2019).

Second, prospective entrepreneurs can develop knowledge of wicked problems from different forms of work experience, such as humanitarian, community, or volunteer work experience (Corner and Ho, 2010). Although they may not directly experience the problem through personal suffering, prospective entrepreneurs interact and embed themselves with those who do, thus providing depth of insight enabling them to comprehend the problem in new and useful ways (Dorado, 2006). A significant benefit from such experiences is that, when individuals are embedded in a context, they are more likely to understand how the social and resource systems interconnect (Baker, 1990). Embeddedness creates increased opportunities for interaction with community stakeholders (Shaw and Carter, 2007), further creating opportunities to understand the problem. As an example of gaining this type of experience, Australian Michael Linke started BEN Namibia, a social enterprise that distributes bicycles to volunteer health workers and maintains them through repair workshops. Previously, Michael volunteered in the UK for a charity called *Re*-cycle, which collects unwanted bikes and ships them to partner organizations in Africa. He also spent time with a social entrepreneur in Cape Town to better understand the problem that he was trying to solve through distributing and managing bicycles.

Third, knowledge of wicked problems can come from collaboration wherein in-depth knowledge of a wicked problem is shared among individuals to learn about the problem (Ferraro et al., 2015). To tackle wicked problems, multiple stakeholders with different forms of expertise are often convened. As Montgomery and her colleagues observe, “much of social entrepreneurship appears, in fact, to be collaborative and collective, drawing on a broad array of support, cooperation and alliances to build awareness, gain resources and, ultimately, make change” (Montgomery et al., 2012:376). Along with these benefits, collaborative social entrepreneurship facilitates the sharing of knowledge and experience among members (Montgomery et al., 2012; Svendsen and Laberge, 2005). Knowledge acquisition in this manner has been termed *vicarious learning* (Huber, 1991) or *social learning* (Bandura, 1977). Such knowledge sharing can help prospective entrepreneurs understand the complex nature of wicked problems developed by drawing on the experiences of others.

With a more advanced understanding of the complexities of wicked problems, prospective entrepreneurs are less susceptible to the reductive tendency. This reduces the extent to which they are adversely affected by problem uncertainty as they are more likely to see the problem, its boundary, and causes for what they are. Knowledge of wicked problems enables prospective entrepreneurs to more accurately answer the question “What problems are out there and what is causing them?”

By more comprehensively understanding wicked problems, prospective entrepreneurs are in a better position not only to determine whether the objective conditions are present to sustain a venture (making them more likely to avoid Type I errors) but also to better judge potential opportunities in light of those conditions (making them less likely to commit Type II errors). They can thus better distinguish which potentially actualizable opportunities should be pursued and which should not. Knowledge also expands the objective range of opportunities that are available to the prospective entrepreneur. As the prospective entrepreneur gains more

knowledge about a wicked problem, the realm of opportunities which are possible for them increases (Ramoglou and Tsang, 2016). While gaining knowledge in and of itself is unlikely to change the objective conditions that preclude opportunity (i.e. it will not turn a non-opportunity into an opportunity), it may open the prospective entrepreneur's eyes to other courses of action that may in fact be actualizable opportunities. Regarding the window of judgment mentioned in the preceding section, knowledge enables the prospective entrepreneur to see a distinction between imagining and believing that decreases the likelihood of forming a belief based on a non-opportunity. Thus knowledge helps to distinguish between what is simply an imaginative idea and what is possible, minimizing the likelihood of forming a belief based on a non-opportunity.

PlayPumps can again illustrate the impact of knowledge on the reductive tendency and subsequently on opportunity beliefs. Despite PlayPumps International exemplifying a failed social enterprise (e.g., Case, 2010), the PlayPumps technology and approach are still in active use. In 2018 six new Playpumps were installed (Kim and Perreault-Henry, 2018a). However, the founder of PlayPumps is no longer leading the operations. With mounting criticism on the inefficacy of the venture, PlayPump International ceased operations and gifted its inventory to Water for the People, a nonprofit specializing in water provision. PlayPumps now sits in a portfolio of potential options for accessing water but are only installed when the conditions are suitable to support its success. With a rich experience in providing water, the founders of Water for the People have knowledge to understand when a PlayPump is viable. Interestingly, the problems encountered by PlayPump International may have contributed to Water for the People's more efficacious use of the technology. That is, in addition to knowledge Water for the People possessed in engaging with the wicked problem of access to clean water, they had the benefit of learning what not to do from PlayPump International. Thus, positive externalities such as vicarious learning from a previously failed attempt at solving a wicked problem may emerge. The impact of knowledge on forming non-opportunity beliefs is illustrated in Fig. 2 and formally stated in our final proposition:

P3. Knowledge of wicked problems gained through experience makes prospective entrepreneurs less susceptible to the reductive tendency when engaging with wicked problems. This has implications for the formation of opportunity beliefs, reducing the likelihood that the entrepreneur forms a belief based on a non-opportunity.

6. Discussion

By their very nature, wicked problems should exude their daunting character and dissuade individuals from engaging with them. We argue neither that historically intractable problems must always remain so nor that social entrepreneurs will always misunderstand them. Instead, we explain how and why the nature of wicked problems can shape the prospective entrepreneur's ability to recognize the objective conditions that surround them and the judgments they form about those conditions when forming opportunity beliefs. We show how this can lead to non-opportunity beliefs (i.e., Type I errors) where individuals form convictions about opportunities for which the objective conditions necessary to actualize them are not in place. While we have focused on wicked problems contextually, our arguments contribute to entrepreneurship research and practice more broadly.

6.1. Contribution to theory on entrepreneurial (non-)opportunities

We bring a focus to the nature of problems and the role they play in the formation of opportunity beliefs. We introduce and conceptualize *problem uncertainty* as a specific form of state uncertainty where the exact definition, boundary conditions, and causes of a problem are unknown or unknowable. This conceptualization lays the foundation for our theorizing on how prospective entrepreneurs form non-opportunity beliefs.

We draw on and extend Ramoglou and Tsang's (2016) critical realist perspective that views opportunities as actor-independent while their pursuit is actor-intensive, with the individual and environment interacting in ways that are formative to opportunity beliefs. According to this view, opportunities are based in objective reality, but they are ultimately propensities that must be actualized by entrepreneurial action (Ramoglou and Tsang, 2016). This opens the door, as our arguments suggest, for entrepreneurs to act on what may ultimately be not merely an opportunity doomed to failure, but a non-opportunity (McMullen and Dimov, 2013; Ramoglou, 2013a, 2013b). We extend the critical realist approach by explicating the mechanisms through which non-opportunity beliefs are formed. To do this, we introduced the reductive tendency as the means by which prospective entrepreneurs mentally simplify the nature of wicked problems, and secondly, we theorized how this simplification influences the formation of opportunity beliefs. Specifically, we suggest that simplification makes it harder for prospective entrepreneurs to distinguish between ideas that should be left in the realm of imagination because the objective conditions to enable its realization are not present, and opportunity beliefs where the objective conditions to enable its realization are present. By analyzing the nature of wicked problems, we theorize non-opportunity materially. But, more importantly, we uncover the specific mechanisms by which non-opportunity beliefs may be formed, and by extension, suggest that taking a problem-centered approach is necessary in understanding entrepreneurial opportunities more broadly.

6.2. Implications for future research on entrepreneurial (non-)opportunities

Our focus on problems suggests a need for continued research on the nature and effects of uncertainty. In McMullen and Shepherd's (2006) model of opportunity belief formation, the central question is whether *any* type of uncertainty – state, effect, or response – can be understood and borne to allow for opportunity belief to be formed. However, as we argue above, in the case of wicked problems, the question is not what prevents opportunity beliefs (Type II errors) but why non-opportunity beliefs (Type I

errors) are formed. By introducing problem uncertainty – a particular form of state uncertainty – we bring greater fidelity to the study of uncertainty type. We suggest that a similar approach can be useful to the broader discussion of uncertainty across all kinds of entrepreneurship. Going beyond a focus on uncertain outcomes to questions about uncertain problems may help us rethink fundamental questions about why some people are able to identify and pursue opportunities to solve some problems while others do not (Suddaby et al., 2015).

Our theorizing focuses on how non-opportunity beliefs are formed, rather than the actor-intensive nature of behavior based on those beliefs. A common criticism of the realist approach to understanding opportunities is that it does not take time into account (e.g. Berglund and Korsgaard, 2017). Although it is not possible to know in the case of failure whether there was no opportunity to begin with or whether the opportunity was left unactualized, the lens of non-opportunity can provide insights into the judgment of the entrepreneur and how learning about the complexity of the problem as a basis for opportunity informs their judgment. The decision to invest in the realization of an opportunity requires the entrepreneur to continually make judgments about the potential of the opportunity and whether through action and effort it can be successfully realized (Mcmullen, 2015). What becomes important is that the entrepreneur learns about the potential of the opportunity and abandons those startup attempts where the objective conditions to enable the actualization of the opportunity are not present (Davidsson, 2015). Bringing this problem focus to the broader study of opportunity could help to answer calls for further examination of entrepreneurship as process and method (Baker et al., 2003; McMullen and Dimov, 2013; Sarasvathy, 2003; Sarasvathy and Venkataraman, 2011; Selden and Fletcher, 2015; Venkataraman et al., 2012) where non-opportunity and problem uncertainty can provide insights into why some startup attempts are abandoned or evolve in unexpected ways.

It is our hope that our approach may also enable productive new theoretical developments that draw on the vibrant discourse on the nature of opportunity (e.g. Alvarez and Barney, 2007; Alvarez et al., 2012; Alvarez et al., 2014; 2017; Alvarez et al., 2010; Davidsson, 2015, 2016; Ramoglou and Tsang, 2016, 2018; Ramoglou and Zyglidopoulos, 2015; Ramoglou, 2013a, 2013b; Shane, 2012). In this paper, we sought not to defend a particular perspective nor to reconcile differing ontological/epistemological positions, but to draw on the rich, meta-theoretical insights this ongoing debate has produced to develop new theoretical arguments that address our research question. We posit that a problem-centric approach to opportunity can facilitate future research that does the same. The literature dating from when the IO nexus was introduced often mentions that the possibility of solving customer problems can create value (e.g., Ardichvili et al., 2003; Shane, 2000; Venkataraman, 1997). A focus on solving problems is clearly evident in social and environmental entrepreneurship research (e.g., Bacq et al., 2016; Dees, 2017; Gras and Lumpkin, 2012; Lumpkin et al., 2013; Tracey and Phillips, 2007; York and Venkataraman, 2010; Zahra et al., 2009), and looking for customer problems to solve as a starting point is key to the way we teach entrepreneurship (e.g., Neck and Greene, 2011; Neck et al., 2014; Neck et al., 2017). Thus, we suggest a problem-centric lens could facilitate future theoretical and empirical exploration as a starting point for understanding the entrepreneurship process that also has the potential to offer new insights into the relationships among external conditions, entrepreneurs, and opportunities (Davidsson, 2015; Shane, 2003).

6.3. Contributions to theory on entrepreneurial knowledge

We introduce the reductive tendency, a process through which individuals simplify complex systems into cognitively manageable representations as they learn about them, to understand how and why prospective entrepreneurs simplify wicked problems and the implications of this tendency for the formation of opportunity beliefs. By focusing on the consequences of simplification in high stakes environments, we shift focus from the benefits of simplification to overcome doubt and enable action (Shepherd et al., 2007; Wood et al., 2014) to the downside of simplification for increasing the likelihood of a prospective entrepreneur forming a non-opportunity belief where the subsequent implications of acting on this belief is the failure of the venture. Relatedly, lack of human capital is frequently cited as a cause of entrepreneurial failure (Shepherd and Wiklund, 2007) and we offer the reductive tendency and resulting simplification of the problem as a more refined explanation as to why lack of human capital, in the form of knowledge of the problem gained through experience, is a common cause for new firm failure.

By introducing the role of experiential knowledge into our theorizing, we show how it can reduce the impact of the reductive tendency when forming an understanding of wicked problems, thereby simultaneously reducing the likelihood of forming non-opportunity beliefs and increasing the scope of what is possible for that prospective entrepreneur. This enables these entrepreneurs to develop actualizable opportunities which take into account the wicked nature of the problem while also having the knowledge to act on them. This extends the literature on experiential knowledge in entrepreneurship by illustrating a potential mechanism by which experiential knowledge enables some entrepreneurs and not others to realize actualizable opportunities. We suggest experience reveals the layered complexity of a problem which observation from afar cannot. Such experience enables prospective entrepreneurs to make better judgments about the potential of an opportunity (Mcmullen, 2015) resulting in them pursuing opportunities which have a greater likelihood of succeeding and avoiding those that do not. This extends Corner and Ho's (2010) discussion of experience corridors in social entrepreneurship by explicating how and why experience with a problem enables prospective entrepreneurs to identify opportunities. The social entrepreneurship literature has acknowledge the importance of experience and depth of understanding of wicked problems (Dorado, 2006) but has yet to systematically unpack the role of such experience for the formation of opportunity beliefs (Corner and Ho, 2010).

6.4. Implications for future research on entrepreneurial knowledge

The reductive tendency also brings to the fore the importance of learning from experience during entrepreneurship (Cope, 2005;

Politis, 2005). Through acting on an opportunity, entrepreneurs learn about the complexity of the problem they are trying to solve and are therefore in a better position to make a judgment about the potential of the opportunity and what is required to actualize the opportunity. In this way, our arguments extend McMullen's conceptualization of entrepreneurial judgment as a series of decisions made over time (Mcmullen, 2015). His focus was on the developing and bearing out of empathic accuracy such that judgment about an opportunity can be seen as a process. Our work suggests that, through knowledge, insights about the definition, boundary conditions, and causes of problems may also be developed and borne out over time. As we point out, this does not mean that a non-opportunity can become an opportunity, but it may make other, realizable opportunities easier to see and may also better enable collective action that may change the objective conditions that surround the problem. In other words, the entrepreneur may not always have an opportunity to solve a problem, but he or she does always have an opportunity to learn more about it. In this sense knowledge shapes and changes the nature of the opportunity as entrepreneurs gain a greater understanding of what is required to achieve their goals.

6.5. Contribution to theory on social entrepreneurship

Our paper joins a growing stream of research linking wicked problems and grand challenges to social entrepreneurship (Alvord et al., 2004; Dorado and Ventresca, 2013; Ferraro et al., 2015; Hervieux and Voltan, 2018; Waddock and Post, 1991). We place wicked problems and their characteristics at the center of our theorizing to show how they shape the mechanisms driving (non-) opportunity belief formation.

Prosocial motivation has received a great deal of attention in the social entrepreneurship literature (e.g., Bacq and Alt, 2018; Conger, 2012; Conger et al., 2018; Mair and Noboa, 2006; Miller et al., 2012; Wry and York, 2017), while we focus instead on knowledge (and the lack thereof) in shaping the formation of beliefs. In this way, our contribution is not only additive but also complimentary to this prior research. We show how the reductive tendency can lead prospective entrepreneurs to an unsuitably simplified understanding of wicked problems. Concurrently, prosocial motivation increases the desirability of acting on perceived opportunities by meeting the prospective entrepreneur's emotional and moral desire to alleviate suffering (Miller et al., 2012) and address societal and environmental ills. With such a powerful motivation to effect change, the reductive tendency's offering of seemingly simple problems may be particularly seductive to these would-be social entrepreneurs.

6.6. Implications for future research on social entrepreneurship

Our focus on wicked problems and deeper integration with established theories of opportunity (McMullen and Shepherd, 2006; Ramoglou and Tsang, 2016) and knowledge has implications for future research on social entrepreneurship. Scholars have endorsed the utility of social entrepreneurship as a distinctive context for extending and challenging existing theory in the broader entrepreneurship domain (e.g., Battilana and Lee, 2014). We suggest that continued use of wicked problems and grand challenges as lenses for problematizing the entrepreneurship process may open new opportunities in this effort. For example, the interrelated nature of wicked problems (e.g., education and poverty or poverty and hunger) are part of what drives their complexity and the evaluative nature of how they can be understood. This should prompt us to look more closely at whether and how these problem *relationships* may affect and be affected by entrepreneurial action.

Wicked problems are not a prerequisite for the presence of social entrepreneurship; instead they are boundary condition of our theorizing. Many kinds of opportunities for social entrepreneurship exist. Social entrepreneurs may, for example, bring ‘unit-level solutions’ (Dorado and Ventresca, 2013) to clear and manageable problems. Zahra et al. (2009) ‘social bricoleur’ addresses small-scale local social needs and possesses the knowledge and resources to sufficiently address the needs. Extending our theorizing more broadly to the context of social entrepreneurship, different types of social entrepreneurs may be more or less susceptible to the reductive tendency depending on the nature of the problem they are trying to solve and the scale at which they are trying to do this. Zahra et al. (2009) typology of social entrepreneurs – which takes into account how social entrepreneurs pursue social opportunities and the reach their solutions have on the broader social system – combined with Smith and Stevens' (2010) extension of this typology to include the geographic reach of these entrepreneurs provides a framework for further theorizing on the role of the reductive tendency in social entrepreneurship more broadly. For example, as social entrepreneurs shift their focus from addressing social needs within a local community to addressing social needs at a grand scale, their level of embeddedness within a single community decreases, creating the conditions for the reductive tendency to manifest.

Perhaps the most obvious implication of our theory is what it reveals about the potential dark side of social entrepreneurship (Chell et al., 2016; Cho, 2006; Dacin, 2013; Dacin et al., 2011; Dey and Steyaert, 2016; Dorado and Ventresca, 2013; McMullen and Warnick, 2016). Several of these studies cite a concern consistent with the Foucault's work in ethics (Dey and Steyaert, 2016; Dorado and Ventresca, 2013). Namely, any unilateral attempts to address wicked problems are bound to be ‘clumsy’, even if they do not fail completely. Under the best of circumstances, opportunities to solve wicked problems are “one-shot operations” (Rittel and Webber, 1973:163) where, in the event of failure, pursuing these opportunities could cause more harm than good. This creates a high stakes environment where understanding why attempts to address wicked problems can fail has high practical relevance. The reductive tendency can help explain why many attempts to solve wicked problems fall short (Dorado and Ventresca, 2013). By misconstruing the complexity of the wicked problem, prospective entrepreneurs risk implementing solutions that do not solve them, and perhaps do even more harm than good (Dorado and Ventresca, 2013).

6.7. Implications for practice

Our theory also offers several implications for prospective entrepreneurs wishing to tackle wicked problems. Most notably, we illuminate the susceptibility of prospective entrepreneurs to the reductive tendency when aiming to tackle wicked problems where the consequence is overly simplistic solutions that do not help alleviate the wicked problem. We further suggest that this may be avoided through in-depth understanding of the problem and provide actionable methods of gaining such understanding. The apocryphal adage often attributed to Einstein, "If I had only one hour to save the world, I would spend fifty-five minutes defining the problem, and only five minutes finding the solution" is worth considering. Prospective entrepreneurs would do well to gain experience and develop expertise about wicked problems before trying to solve them. We recommend that when feeling compelled by compassion to help those suffering in this world, they would find real and meaningful opportunities to expose themselves to the wicked problem they wish to address so they can acquire vital experience and avoid the seductive call of the reductive tendency. One way they can do this is by working with experts and learning about the problem through different forms of work experience.

We would also urge prospective entrepreneurs to seriously consider potentially negative consequences if they do pursue what could be a non-opportunity. If, as we suggest, the reductive tendency tends to lead them to wrongly simplify their understanding of the causes and outcomes of addressing wicked problems, we can expect poor and perhaps even grave consequences for the people they try to help. The most obvious way this could manifest itself would be in unintended consequences. Because of their interrelated nature, causal ambiguity, and the impossibility of understanding their true nature a priori, attempts to solve wicked problems can trigger new chains of persistent social ills. Also, we must take seriously the issue of problem normativity; the inextricably entwined nature of human values and norms with problem formation and resolution (Farrell and Hooker, 2013). Wicked problems have variable ontologies (Callon, 1998; Ferraro et al., 2015), shape and are shaped by the interpretation of multiple stakeholders (Dentoni et al., 2016; Reinecke and Ansari, 2016), and thus have neither a true or false solution nor an ultimate means for testing solutions (Rittel and Webber, 1973). We suggest prospective entrepreneurs must grapple with these difficulties if they hope to minimize the potential downside of tackling wicked problems. This is not to say that we expect entrepreneurs to be infallible. Indeed, it may be that failed attempts to solve wicked problems allow others (or those entrepreneurs themselves) to learn and reduce the effects of the reductive tendency in the future. Instead, we suggest that entrepreneurs seeking to address social ills take the same approach as physicians who, even when choosing to administer high-risk treatments, still strive to first do no harm.

The concept of non-opportunity also has pedagogical implications as it provides a language and process through which the feasibility of students' ideas can be considered. Evaluating ideas through a non-opportunity lens would emphasize the necessity of favorable external conditions in new venture formation (Mullins, 2012), and openness to the absence of these conditions. We often encourage students to get into the field and learn about these external conditions by becoming familiar with economic and consumer trends, strategic positions of other players in their industry, and the like. We also ask them to assess market potential through consumer surveys or offering pre-orders of a product. While these steps are common in the entrepreneurship classroom, the emphasis is often on finding reasons why something is an opportunity as opposed to why it may not be (Mullins, 2012). Employing non-opportunity language would flip the emphasis and aid in building a more holistic evaluation of ideas. Moreover, robustly discussing and teaching the objective conditions needed to support the realization of opportunities complements existing dominant approaches to teaching entrepreneurship, such as effectuation (Sarasvathy, 2001) and the Lean Startup method (Ries, 2011) which have a predominately inward entrepreneur focus.

6.8. Limitations and opportunities for future research

As with any study, ours has limitations. We intentionally limit our focus to theoretical development and to opportunity beliefs in the setting of wicked problems. Of course, the interest of social entrepreneurship scholars goes well beyond the formation of opportunity beliefs and wicked problems. Ultimately, we wish to answer the same question as many in society more broadly. That is, whether and how entrepreneurship can help address wicked social and environmental problems (Lumpkin et al., 2013). In addition to what we outline in our discussion, future research could consider how wicked problems may continue to affect entrepreneurs as they take action on their opportunity and continue their entrepreneurial journey. For example, it would be valuable to understand the potential for spillover effects of the experience and learning the entrepreneur may gain by pursuing an opportunity, or non-opportunity, to solve wicked problems. This may tell us more about social entrepreneurship as a non-zero-sum game that must be played over multiple attempts and learning from each.

Our theory is also limited by our intentional focus on the reductive tendency. We found this perspective to be particularly useful in explaining why and how individuals come to believe they have an opportunity to solve a wicked problem. However, we believe addressing this question from other perspectives, especially within the domain of social psychology, may shed more light on the mechanisms we describe here. In particular, sociological theories of identity (Stryker, 1980; Burke, 1980) and symbolic interactionism (Blumer, 1962) could be especially enlightening, as they recognize that the beliefs, understandings, and actions of individuals occur and relate within their social and institutional context.

Our theory would further benefit from the critique of scholars rooted in different philosophical paradigms. In particular, theories focused more on radical change and structural power dynamics (Burrell and Morgan, 1979) could provide important new perspectives to refine the ideas we offer here. For example, feminist theory has been useful in illuminating important ways in which individual and structural beliefs about gender shape the entrepreneurial experience (see Hughes et al., 2012).

Finally, we address the concept of wicked problems only in the abstract. While this is necessary to build generalizable theory, it also prevents us from uncovering deeper insight that may be found through a more contextualized dive focused on a particular

wicked problem, and the lives of the people who suffer from it. Future research should consider wicked problems and opportunities from multiple cultural perspectives and particularly those perspectives specific to the affected populations.

7. Conclusion

Solving social problems is possible. Many entrepreneurs are subject-matter experts who understand, respect, and compensate for the complexity of the social problems they battle. However, there also is no shortage of anecdotes about entrepreneurs who charged into a wicked problem, only to find that they did not grasp the underlying complexity, often to disastrous effects (e.g., Stellar, 2010). Despite the daunting task of addressing these complex problems, many entrepreneurs continue to create new ventures to engage with them (Kickul and Lyons, 2016). This paper offers one explanation to account for this phenomenon. For those pursuing entrepreneurial solutions to wicked problems, we recommend that they, to paraphrase M. Scott Peck (1998:14),

> Abandon the urge to simplify everything, to look for formulas and easy answers, and to begin to think multidimensionally, to glory in the mystery and paradoxes of [wicked problems], not to be dismayed by the multitude of causes and consequences that are inherent in each experience – to appreciate the fact that [a wicked problem] is complex.

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