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# Entrepreneurial Beliefs and Agency under Knightian Uncertainty

Randall E. Westgren [1] · Travis L. Holmes [2]

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**Abstract**
At the centenary of Frank H. Knight's *Risk, Uncertainty, and Profit* (1921), we explore the continuing relevance of Knightian uncertainty to the theory and practice of entrepreneurship. There are three challenges facing such assessment. First, *RUP* is complex and difficult to interpret. The key but neglected element of *RUP* is that Knight's account is not solely about risk and uncertainty as states of nature, but about how an agent's beliefs about uncertain outcomes and confidence in those beliefs guide their choices. Second, *RUP* is Knight's only effort in this area. His subsequent career led elsewhere, so he did not engage with subsequent interpretations of this work. Third, much of the current literature emphasizes that decisions must be different under the two states of nature with a consequent misunderstanding of entrepreneurial agency. This paper addresses each challenge in sequence. First, we explicate Knight's (1921) approach and explain why that approach is murky. Second, as a complement to Knight's interpretation, we examine Frank P. Ramsey's approach to subjective probabilities to help clarify Knight's murky approach. What links Knight and Ramsey is a shared pragmatism about entrepreneurial agency under uncertainty that depends upon the beliefs about, and confidence in, their judgments of possible outcomes. This Knight-Ramsey approach does not require actor's behaviors to be determined by the class of uncertain environment (whether risk, uncertainty, or ambiguity) they face. We focus on the response by the entrepreneur to the existence of uncertainty in all its forms. We argue that this reductive account provides a foundation to examine common problems in management, including managerial hubris, the interaction between entrepreneurs and venture capitalists, and the need for experimentation (such as prototyping and market research) in advance of new product and venture launches. Third, we critique current literature that favors epistemic purism about the ontology of risk and uncertainty and ignores Knight-Ramsey pragmatism in meeting uncertainty, such as using formal and informal institutions for uncertainty mitigation. Our account locates Frank Knight's subtleties in entrepreneurial behavior firmly in the literature on entrepreneurial agency a century later.

**Keywords** Agency · Entrepreneurial beliefs · Uncertainty · Pragmatism · Uncertainty mitigation

✉ Randall E. Westgren
westgrenr@missouri.edu

Extended author information available on the last page of the article

## Introduction

*"[I]n social science and philosophy, discussions of fact have a way of transforming themselves into arguments about what somebody really said."* (Knight 1925)

The quotation above from Frank Knight, the emerging scholar, is ironic for two reasons. First, Knight spent the remainder of his career thoroughly engaged in such arguments with and about Hayek, Keynes, Dewey, and scores of others. Second, a century after the publication of *Risk, Uncertainty, and Profit* (*RUP*), we remain engaged in interpretation of what Knight meant in this edited version of his 1916 doctoral dissertation. We know what he wrote, but we still argue over meaning and implications. And so it goes with many of his subsequent publications, as his perspectives and arguments change over the half-century following *RUP*.

Given this interpretative murkiness, the implications of Knight's account for entrepreneurship in *RUP* are left unclear.[1] Further compounding this problem is that Knight's argument about the nature of uncertainty and how it affects entrepreneurial behavior shuffles the internal (decision-maker) and external (decision environment) perspectives on uncertainty together throughout. We argue that this Gordian knot can be disentangled by viewing Knight's account of risk and uncertainty through the lens of Frank Ramsey's account of agency under uncertainty. Knight's treatment of uncertainty ultimately concerns the entrepreneur and as such the main emphasis is placed on the uncertainty surrounding decisions relevant to the entrepreneur; e.g. how uncertainty can be mitigated in investment decisions. Alternatively, Ramsey's treatment of uncertainty is indexed at a more general agential level, orienting around how to undertake decisions in everyday life under conditions of uncertainty. By understanding Knight's entrepreneurial treatment via Ramsey's view, the Knightian account of entrepreneurship becomes transparent: the entrepreneur meets uncertainty given (1) her graded beliefs about a particular venture she wishes to enact, (2) her confidence or graded justification in her beliefs, (3) the availability and cost of external methods for meeting uncertainty, (4) the availability and cost of internal methods for meeting uncertainty, and (5) her perception of the utility of acting on her beliefs ( as if 'p'), given (1) through (4). On the question of whether the agent will act, we argue that there is nothing inherent in the ontology or epistemology of risk and uncertainty that answers this question.

The core implications of this paper are as follows. First, by supplementing Knight's treatment of uncertainty and risk with the Ramseyan account, the relevance of Knight's account for entrepreneurship in *RUP* is restored. Second, this account, which emphasizes the pragmatic elements in decision-making under uncertainty, is applied to extant debates regarding uncertainty in entrepreneurship. Specifically, the account is shown to provide a deflationary alternative[2] to many of the issues which predominate in recent views on these

[1] We use the term entrepreneurship in the sense of a management function, not as a specific organizational type (start-up, new venture, small business) nor as individualistic agency. We use the standard definition of agency following Anscombe (1957), Davidson (2001), and Bratman (1987): agency as intentional action. Entrepreneurship may occur as the founding of a new stand-alone firm, often of small scale. But it may occur in large organizations with many participating managers engaged in a new activity with innovative processes and/or products. Regardless of the scale, scope, and structure of this function, it is inextricable with the concept of agency under conditions of uncertainty – the *raison d'être* of Frank Knight's *RUP* and the bulk of current literature on entrepreneurship.

[2] The characterization of our account as a "deflationary" one simply implies that we take many of the issues that predominate discussions of entrepreneurial uncertainty (e.g. the drawing of determinate boundary conditions) as less central than many of these authors would have it. Our pragmatic account displaces emphasis from these kinds of questions, refocusing on the particular internal and external factors which are more central to decision-making. This refocusing become clearer in our exposition of the account in section 4.

topics where these include: partitioning the uncertainty surrounding decisions into risk, uncertainty, ambiguity and other categories as well as erecting determinate boundary conditions between these categories –rightly drawing attention back to the pragmatic elements of decision-making under uncertainty. This pragmatic view permits us to closely examine the entrepreneur's beliefs and justification for making the requisite investments and to make the choice to engage in, or forego, uncertainty mitigation before investing. Thus, the pragmatic view is better geared towards issues which lie at the heart of entrepreneurship. Finally, the analogy between Knight's and Ramsey's view is drawn out by demonstrating how institutions can play the role of uncertainty mitigation for the entrepreneur in Knight's account.

This paper proceeds as follows. In section 2, we unpack Knight's general argumentative approach as well as the general structure and motivations of his view in *RUP*. In section 3, we exploit Frank P. Ramsey's account of subjectivism (1926, 1929) which is concise and clear, and conforms to Knight's account, including intentionality and agency. We examine Frank Ramsey's account of probabilities as agential beliefs, published in the decade after *RUP*. Ramsey's conception of subjectively probabilistic reasoning in human action permits us to put aside many of the risk-uncertainty boundary issues and focus on the consequences for agency. Moreover, Ramsey writes in the tradition of C.S. Peirce's pragmatism and incorporates decision context and human experience – two salient ideas in *RUP*. We interpret several passages from *RUP* through the Ramseyan lens to connect Knight to both the logic of subjective probabilities and to pragmatism. In section 4, we turn to apply Knight's account, now supplemented by Ramsey's pragmatic view, to an extant debate regarding the nature of uncertainty and the boundary conditions for uncertainty and risk. The account is shown to contribute towards this debate by representing a clear pragmatic alternative to these more typical approaches. In section 5, the role of institutions for entrepreneurial uncertainty mitigation is demonstrated to tighten the analogy between Ramsey and Knight. Section 6 concludes.

## Frank Knight on Risk and Uncertainty

One of Knight's common forms of argumentation is Francis Bacon's (1620) *pars destruens* and *pars construens* form. *Pars destruens* is a negation of some existing account, wherein errors and prejudices are isolated and expunged. *Pars construens* replaces the resulting lacunae with new constructs and arguments to make a correct, or more compelling, account. This sequencing of argumentation represents the structure of *RUP*. For an outline, see Table 1 below.

Following two introductory chapters, Knight describes the theory of choice under certainty for consumers and for firms and the mechanisms of market exchange (chapters III - VI). Like most of the accounts of classical and neoclassical economics extant in *fin de siecle* economic literature, this presentation is concerned with distribution, or imputation, of the market value of goods to productive resources as wages, rents, and interest. Given a model of perfect competition and perfect information – Knight's *omniscience*, there is no profit, as perfect competition permits easy entry and exit so as to drive revenues down to known costs.

As *pars destruens*, he denies omniscience and defines imperfect competition as enterprise under risk and uncertainty. The *pars construens* of the account first makes the distinction between risk, as *a priori* or statistical representations of the decision outcomes, from uncertainty as unknown distributions of outcomes. In the latter case, there are insufficient observations to form probabilistic distributions of decision outcomes (Chapter VII). Knight defends uncertainty as the necessary condition for the existence of profit for managers (entrepreneurs)

**Table 1** An outline of *RUP* with chapter summaries

| Chapter Numbers | Topics Addressed |
|---|---|
| I, II | Introduction to profit and uncertainty and their place in received economic theory of the firm |
| III, IV | Theory of choice under certainty: supply, demand, and exchange |
| V | Dynamics of the firm under certainty: comparative static analysis |
| VI | Idealization for models of perfect competition, ignoring "social value" |
| VII | The delineation of risk and uncertainty |
| VIII | Entrepreneurial strategies for mitigating risk and uncertainty |
| IX, X | Management ability, judgment, control within the firm, claims on profit |
| XI, XII | Societal implications of enterprise-level decisions and the public interest |

who make investments in new production technologies. In Chapter VIII, he writes of "methods for meeting uncertainty" – how the manager can reduce uncertainty for a particular new activity by *specialization* or *consolidation*: costly actions that will limit the perceived uncertainty. In this exposition, he writes of institutions external to the entrepreneurial firm such as insurance, speculative markets, and specialized financiers that we now recognize as venture capitalists. In Chapter IX, he makes the move that places *RUP* at the center of modern entrepreneurship; he separates contractual income and payments from residual claims on uncertain revenues. That is, the entrepreneurial function of uncertainty-bearing earns the residual profit after labor and inputs are paid contractually. The residual claim on profits may be the property of an individual entrepreneur, shared among the team of managers, or shared with the venture capitalist. In the final chapter of the *pars construens,* Knight speaks of knowledge specialization and control in the corporate organization that foreshadows the important literature on principal-agent theory and corporate governance. We leave aside Chapter X in this paper and focus on the meeting of uncertainty with the intent to earn residual profits. Our focus will be primarily on chapters VII through IX.

More than ninety years after Knight stopped writing about uncertainty, the literatures of economics and organization theory remain engaged with the proper boundary conditions between risk and uncertainty and implications for agency, respectively. Foss and Klein (2012) catalogue accounts of Knight's thinking issued over the last forty years that tie Knight to subjective probability theory, the economics of information, agency theory, and a number of ontologies of the epistemic states beyond certainty: risk, uncertainty, ambiguity, and unknown unknowns. A significant implication of many of these accounts is that the agent who operates under a given epistemic state behaves differently than an agent who operates under a different state. Thus, entrepreneurial behavior depends upon the epistemic nature of the non-certain decision environment. This is explicit in several recent accounts, including Packard et al. (2017) and Packard and Clark (2019).

For Knight, the boundary between certainty and risk, particularly in static economic theorizing, is uninteresting. To the extent that probabilities of future price distributions for factors of production are predictable from *a priori* or statistical inference, the process of economizing is reducible to static theorizing. It is illuminating to go to the true point of the second half of *RUP*, the *pars construens* of a dynamical theory of entrepreneurial profit under uncertainty. It is most clearly illustrated early in chapter VIII.

> "At the bottom of the uncertainty problem in economics is the forward-looking character of the economic process itself. Goods are produced to satisfy wants; the production of

> goods requires time, and two elements of uncertainty are introduced, corresponding to two different kinds of foresight which must be exercised. First, the end of productive operations must be estimated from the beginning. It is notoriously impossible to tell accurately when entering upon productive activity what will be its results in physical terms, what (a) quantities and (b) qualities of goods will result from the expenditure of given resources.
>
> Second, the wants which the goods are to satisfy are also, of course, in the future to the same extent, and their prediction involves uncertainty in the same way. The producer, then, must estimate (1) the future demand which he is striving to satisfy and (2) the future results of his operations in attempting to satisfy that demand" (Knight 1921, pp. 237-238).

For Knight, this is the knowledge problem: epistemic uncertainty surrounding the economic venture. For a new entrepreneurial venture, epistemic uncertainty is rife. New processes and new products require conjectures or, to use Knight's term, estimates, for which there are no *a priori* or statistical probability distributions. For the existing venture, there will be data on actual costs, customer purchases, and competitor reactions over time. The scope of epistemic uncertainty diminishes for the established firm, but it will only result in the opportunity for statistical inference to the extent that consumer behavior and competitor behavior remain static and that the entrepreneur and the other human resources in the firm maintain control of the production process.

We also leave aside the boundary conditions that putatively separate risk from uncertainty. We will consider uncertainty simply as Knight does in chapters VII, VIII, and IX: all types of phenomena that violate the static economic model of the firm under certainty. This will include both epistemic uncertainty – the knowledge problem – and aleatory uncertainty – stochasticity in economic processes and variables (Hacking 1975, Dequech 2011, Packard and Clark 2019, Holmes and Westgren 2020). We focus on the response by the entrepreneur to the existence of uncertainty in all its forms. Entrepreneurs form estimates (beliefs) about their venture in the face of uncertainty and exercise judgment in making the requisite investments in advance of market entry. They may also mitigate their perceived uncertainty by making additional investments in learning (i.e. market research) or in available tools for managing exposure to uncertainty.[3]

We begin with an individualistic account of decision-making under uncertainty that is consistent with Knight's account but treats the unknowns as *partial beliefs*, a subjectivist construct. This account is due to Frank Ramsey (1929), who developed this pragmatic decision theory in the decade following the publication of *RUP*. We interpret Knight's account of entrepreneurial agency in Ramsey's framework, in part on the basis of shared conceptions of a pragmatic epistemology. Ramsey specifically includes confidence (in the beliefs), the cost of uncertainty mitigation, and the utility of the decision-maker, all of which are treated tacitly by Knight.

[3] The authors gratefully acknowledge a point raised by a reviewer that Knight's distinction between risk and uncertainty has been elided by economists, who take comfort in the ability to model risk as known probability distributions. In the management literature, risk is set aside in favor of conceptualizing uncertain decision environments, which obviates the need for complex mathematical models. Entrepreneurs act on beliefs and confidence (where this is subjective) to meet uncertainty with investment decisions. In this paper, we avoid the issue of whether the state of nature of uncertainty around an entrepreneurial action is aleatory or epistemic. We are concerned with how the uncertainty is "met" in an entrepreneurial context, to use Knight's term.

## Knightian Uncertainty through the lens of Ramsey's Subjective View of Probability

We shall claim that some overlooked features of Knight's view of uncertainty can be illuminated via comparison with Frank P. Ramsey's view of *partial belief*. Ramsey's view constitutes a subjective notion of probability which received further development in the work of Savage (1954) and Jeffrey (1965). After briefly outlining Ramsey's subjective view of probability, we shall then isolate the pragmatist character of the view, finally shifting our focus to how the view handles agency under uncertainty. Similarities to Knight's view emerge via consideration of Ramsey's treatment of uncertainty.

### Ramsey's View of Partial Belief and Subjective Probabilities

The distinctiveness of Ramsey's view of partial belief emerges from how this conception of probability broke from the then prevailing objective view of probability. The objective or logical interpretation of probability, notably advanced by J.M. Keynes, held that the probability of some proposition is logically determinable by inferences following from the evidence one possesses towards that proposition (Keynes 1921). More technically, probabilities consist of an objective and quantifiable relation between propositions where the probability of some hypothesis, $h$, given the evidence for it, $e$ or Pr ($h$/$e$) is equivalent to the degree which $h$ is logically implied by $e$. Naturally, the question arises wherein are these objective, logical relations to be found? Keynes' reply is that these relations are accessible by intuition. However, Ramsey finds this claim dubious:

> "[T]here really do not seem to be any such things as the probability relations [Keynes] describes. He supposes that, at any rate in certain cases, they can be perceived; but speaking for myself I feel confident that this is not true. I do not perceive them… moreover I shrewdly suspect that others do not perceive them either, because they are able to come to so very little agreement as to which of them relates any two given propositions. "(1926:161).

Given his doubts about alternative interpretations of probability, Ramsey moves to introduce his own subjectivist interpretation. For Ramsey, "the degree of a belief is a causal property of it, which we can express vaguely as the extent to which we are prepared to act on it" (Ramsey 1926: 169). In other words, the degree of belief an individual holds towards a proposition is determined by how strongly the proposition causes the agent to act as if the proposition were true. Grounds for this nexus between an agent's behavioral dispositions and degree of belief in a proposition is clarified in an earlier essay where Ramsey observes that "the equivalence between believing 'not-p' and disbelieving 'p' is to be defined in terms of causation, the two occurrences having in common many of their causes and many of their effects" (Ramsey, 1927: 44). Markedly, Ramsey's view does not adopt a binary conception of belief where belief is an all or nothing attitude of the agent in question but rather a partial one where belief comes in degrees, hence the "partial" qualifier in partial belief (Christensen 2004). Recent work in epistemology speaks of *graded belief*, as well as graded levels of justification for those beliefs (Fantl and McGrath 2009). Graded and partial beliefs are synonymous in use. Justification is, generally speaking, more highly graded when it is based on *a posteriori* statistical reasoning and experience; this is evident in Knight's example of multiple cases.

Ramsey draws further on the connection between behavioral dispositions and belief in order to measure belief. Per his account, an agent's degree of belief in a proposition is measurable by the agent's choice behavior among bets about a proposition's obtaining or not obtaining. This amounts to an operational definition of belief: beliefs are internal states of the agent which are measurable from observations of their external, betting behavior[4] (Ericksson and Hájek 2007). To demonstrate the equivalence of an agent's strength of beliefs and her betting behavior, the following anecdote is adduced: "Whenever we go to the station, we are betting that a train will really run, and if we had not a sufficient degree of belief in this we should decline the bet and stay at home" (1929: 131). In this train case, the action of going to the station implies a higher degree of belief in the proposition that "the train will run on time" and remaining at home implies a low degree of belief in the proposition.

Ramsey's view of partial belief is supplemented with both a rationality and a reasonability constraint on belief. Ramsey's view, albeit subjective, is not of the "anything goes" variety. Ramsey avers that for an agent's beliefs to be rational, they must be consistent with something like the Kolmogorov axioms of probability.[5] If an agent's beliefs were inconsistent and thus violated these axioms, that agent would be vulnerable to a "Dutch-book" whereby the agent would be willing to accept sure-loss contracts. Thus, failing to satisfy the consistency requirement is pragmatically irrational. For instance, suppose an agent believes a fair coin will land "heads" with something like probability 0.6 but also that the coin will land "tails" with probability 0.6 in clear violation of the finite additivity axiom. Given these inconsistent beliefs, this agent could very well accept two bets on the coin's next flip: (1) where the agent bets 60 cents on the coin landing heads, receiving 40 cents if the coin lands tails, but also (2) betting 60 cents on the coin landing tails, receiving 40 cents if the coin lands heads. Regardless of the outcome, the agent's loss is ensured since the bookie can decide which contract to exercise given the outcome of the next flip. The moral is clear: beliefs are rational only if they are consistent with the probability axioms.

A further constraint is imposed on "reasonable" belief where agential beliefs must be "well-calibrated" to the evidence an agent has for or against some proposition where the evidence typically regards relative frequencies. Calibration is an epistemic metric which accounts for how closely an agents beliefs about some proposition track her evidence for or against that proposition. Ramsey explains that given a situation where an agent is trying to determine to what degree they ought to believe toadstool mushrooms are poisonous, that agent's belief that some yellow toadstool is poisonous "ought to be equal to the proportion of yellow toadstools which are in fact unwholesome" (1926: 195). Therefore, if 2 in every 100 toadstools are poisonous, to be well-calibrated, an agent's belief that the toadstool before them is poisonous ought to be roughly 0.02. Thus, an agent's beliefs are both rational and reasonable only when

[4] Italian statistician Bruno de Finetti similarly adopted an operationalist conception of belief, arguing for the equivalence between an agent's strength of belief in a proposition, *p*, and her betting behavior with respect to *p*. De Finetti offers the following justification for this tack:

> In order to give an effective meaning to a notion and not merely an appearance of such in a metaphysical-verbalistic sense, an operational definition is required. By this we mean a definition based on a criterion which allows us to measure it. (De Finetti 1990: 76).

[5] Kolmogorov's probability axioms can be informally defined as including: 1. Non-negativity; 2. Normality; and 3. Finite additivity. Non-negativity holds that the probability for some event is a real, non-negative number. Normality holds that the probability that at least one of the events in a given sample space will occur is 1. Finite additivity holds that for the events in a sample space, if are they both exhaustive and mutually exclusive, then these events will sum to 1. (Hájek and Hitchcock 2016).

they are both consistent with the probability axioms and well-calibrated to their respective evidence.

## The Pragmatic Character of Ramsey's Subjective Interpretation of Probability

The pragmatism of Ramsey's view of partial belief is evident in the following two features of the view: (1) first, agential beliefs, preferences and utilities are individuated to the particular agent in question; (2) Ramsey's view is inextricably tied to agency; beliefs matter in the context of *intentionality* and *action*. Intentionality is a cognitive state directed toward something. Among the forms of intentionality are beliefs (about something), desires (for something), knowledge (of something) and intentions to act (to do something). The fact that there are objects of these cognitive states is crucial. The understanding of intentionality as an object-oriented cognitive state originated with Franz Brentano (1874) and his students that worked at the boundaries between philosophy, economics, and the new field of psychology. In the century and a half since Brentano introduced the term, there has been significant work on the relationship between intentionality and action (Anscombe 1957; Bratman 1987; Davidson 2001; Tuomela 1977). One of the organizing concepts of this work is the use of the term *agency* to denote *caused action*; beliefs and desires condition intentions to act, then the agent initiates action (Schlosser 2019). We will use agency in this sense, as it is consistent with both Knight and Ramsey.

More broadly, Ramsey's pragmatism is evinced both in the philosophical underpinnings and mechanics of his view. Part of Ramsey's pragmatism owes to the deeper philosophical commitments he adopted both about the nature of human cognition and its relationship to truth. Specifically, Ramsey adopts a pragmatic conception of truth whereby a proposition's truth depends practically on whether it enables success in a respective endeavor. This view of truth was echoed in the work of earlier pragmatists such as William James and C.S. Peirce (Misak 2020). *Pace* correspondence theories of truth, for pragmatists, the truth of a proposition does not lie in an obscure ontological relation between entities out in the world but rather is performative, residing in the practical value that belief in a proposition confers on the agent's success.

These underlying philosophical commitments about truth and cognition are manifest in the mechanics of the view of partial belief, particularly the relationship drawn between beliefs and action. The view that beliefs represent a causal, behavioral disposition for the agent to act is prefigured in Peirce (Misak 2016).[6] This account permits Ramsey to measure beliefs via an agent's betting behavior: if an agent genuinely believes some proposition, they should be willing to accept bets which reflect their belief in this outcome. Recall also that Ramsey maintained that beliefs must be consistent –where "consistency" requires that beliefs not violate putative axioms of probability– in order to be rational since, if beliefs were inconsistent, an agent would be prone to sanction bets that result in sure losses. This constraint shows irrational beliefs to be pragmatically irrational but not epistemically irrational (Christensen 2004; Weirich 2011).

A further way in which the view that beliefs are reflected in an agent's behavioral dispositions manifests in the view's mechanics is Ramsey's construction of a *representation theorem* whereby beliefs and utilities are derived from agential preferences. Justification for

[6] C.S. Peirce makes a similar argument which undoubtedly influenced Ramsey, namely, that an agent's beliefs manifest in her behavioral dispositions; c.f. "The fixation of belief" (Peirce 1877).

the plausibility of this derivation is once again provided by Ramsey's noting the connection between beliefs, desires and action.

"I propose to take as a basis a general psychological theory, which is now universally discarded, but nevertheless comes, I think, fairly close to the truth in the sort of cases with which we are most concerned. I mean the theory that we act in the way we think most likely to realize the objects of our desires, so that a person's actions are completely determined by his desires and opinions." (1926:174).

The core idea behind the representation theorem is that if agential preferences obey some set of constraints –if they are both transitive and complete– then they can be represented as arising from some particular set of utilities and probabilistically consistent set of beliefs which maximize expected utility. However, this powerful result depends crucially on the link between agential beliefs and preferences. Pragmatism both underscores and enables the representation theorem.

## The Case of Decision under Uncertainty: Ramsey, Knight, and Pragmatism

Similarities between Ramsey's and Knight's view emerge clearly in considering how Ramsey's view of partial belief treats cases of decision-making under uncertainty where evidence is in short supply for the agent. In 'Truth and Probability,' Ramsey describes the following case in which he arrives at a crossroads, only to recognize he is uncertain with respect to whether the left or right fork leads to his intended destination. While mulling this impasse, the agent sees a figure several hundred yards away in a farm field who could provide the necessary information about which is the correct way. Ramsey reasons as follows:

> "… whether I turn aside to ask him will depend on the relative inconvenience of going out of my way to cross the fields or of continuing on the wrong road if it is the wrong road. But it will also depend on how confident I am that I am right; and clearly the more confident I am of this the less distance I should be willing to go from the road to check my opinion. I propose therefore to use the distance I would be prepared to go to ask, as a measure of the confidence of my opinion; and what I have said above explains how this is to be done" (1926: 174).

Ramsey concludes that the decision to seek out the stranger is a decidable by a formula where the degree of confidence in his opinion that right or left is the correct way is negatively related to "*d*"– the distance he would be willing to travel to have his opinion confirmed or disconfirmed.

Treatment of this kind of case is instructive in that it effectively demonstrates a pragmatic view of decisions under uncertainty. The inputs in the choice are all individuated to the agent. The costs of acquiring further information and selecting the wrong path, and the degree of confidence the agent possesses that either right or left is the correct way are functions of that agent's subjective utilities, preferences and beliefs. This parallels Knight's own description of how agents form and evaluate estimates. Recall that for Knight, estimates are judgments issued in cases of uncertainty where outcomes both lack measurable or well-defined probabilities and cannot be insured against. Knight advises that estimates contain two components: "the formation of an estimate and the estimation of its value" where the latter involves the degree of confidence the agent has about the estimate itself (Knight 1921: 227). Similar to Ramsey, this is suggestive of a subjective scheme where estimates are individuated to a particular agent's set of beliefs, her degree of confidence in those beliefs and assessment of costs.To this

end, Knight (1921 pp. 241–242) identifies five characteristics of individuals acting under conditions of uncertainty. (emphases in original).

1. The ability "*to form correct judgments* as to the future course of events in the environment" is constrained by their capacity for perception and inference about the business environment, though they may have superior capacity in some kinds of problems rather than generally, particularly with respect to human action.
2. Relatedly, there is variation in their "capacities to *judge means*" for acting in response to judgments about future events.
3. There is also variation in the individuals' capacities "to *execute* the plans" they devise to respond.
4. Individuals have different levels of *confidence* in their judgments and their power to execute plans according their judgments.
5. Their degree of confidence is not the only element of personal subjectivity. They also have a *conative attitude* toward the decision context that governs their actions, particularly when learning (increased epistemic knowledge) is one possible strategy for adjusting judgments or increasing confidence in their judgments.

> But Knight goes on to say that, "It is clear that we may speak in some sense of the "true value" of judgment and of capacity to act, but it is the person's own opinion of these values which controls his activities. Hence, the five variables are, from the standpoint of the person concerned, reduced to two, the (subjective or felt) uncertainty and his conative feeling toward it." (p.242, emphases added) This corresponds with the personal or subjective probability account of Ramsey.

A further parallel can be drawn between Ramsey's case involving the uncertain pedestrian and Knight's description of an uncertain agent who possesses only an estimate. After laying out the dual components of an estimate, Knight explains:

> "The businessman himself not merely forms the best estimate he can of the outcomes of his actions, but he is likely to estimate the probability that his estimate is correct. The 'degree of certainty' or of confidence felt in the conclusion after it is reached cannot be ignored for it is of the greatest practical significance. The action which follows upon an opinion depends as much upon the amount of confidence in that opinion as it does upon the favorableness of the opinion itself." (Knight 1921: 227)

Knight's claim is clear: after forming an estimate, the subsequent *action* of the businessman is directly guided by the *strength of his confidence* in the correctness of the estimate. The emphasis on the "practical significance" as well as the nexus between belief and action is unavoidably pragmatic, suggestive of the stated link between belief and behavioral dispositions. Further, this dovetails with Ramsey's own treatment of the uncertain pedestrian case where the distance $d$ that the pedestrian is willing to travel to check his opinion is a direct function of the agent's own appraisal of her belief that either the right of left fork is the correct way. Knight mentions a concrete application of this kind of subjective method of forming and evaluating estimates in a case involving how contracts are drawn up between outsiders and the corporation, observing:

> "It is no longer true that men are necessarily unwilling to entrust productive services of person or property, to an outsider without an effective material guarantee of the fixed payment agreed upon. If they have confidence in the manager's ability and integrity they may gladly work with only a partial or imperfect security for their renumerations. To the extent that this is the case such owners of productive services manifestly share in bearing the uncertainty or 'taking the risk' involved in the undertaking." (1921: 290).

This contract case represents a real-world instance of how subjectivity factors into estimates and guides action on Knight's view. The decision to enter into a contract with an outsider without material guarantees is directly a function of the entrepreneur's formation of an estimate that the contract will be fulfilled and her degree of confidence in her estimate. In cases where confidence falls below a certain threshold, the entrepreneur's action would be different; perhaps a different contract would be drawn up or none would materialize.

Turning the disposition to act into tangible action is the essence of Knightian entrepreneurship under uncertainty. The entrepreneur exercises judgment about a particular investment or venture, not to become an entrepreneur – in some vague intent (Foss and Klein 2012). If the strength of belief is high and confidence is high, the entrepreneur makes the investment so as to obtain the expected profit. Absent a strong disposition to act, the entrepreneur will seek to mitigate some of the uncertainty; Knight calls this *meeting* uncertainty.

From the foregoing, similarities between Ramsey's and Knight's view emerge. For a concise catalogue of the noted similarities, see table 2 below.

Both endorse a nexus between an agent's beliefs and action, amounting to a pragmatic view which takes belief to manifest in behavioral dispositions. Further, both provide views which are subjective, individuated to a particular agent's preferences, utilities and beliefs. Finally, both identify an inverse relationship between the degree of confidence an agent possesses in her beliefs and the costs the agent is willing to bear to resolve her uncertainty.

## How the Knight-Ramsey Pragmatic Account Contributes to Extant Debates about Entrepreneurial Decision-Making

The pragmatic view of uncertainty inspired by Ramsey and Knight which we argue for here is opposed by at least one recent view in the literature on uncertainty in entrepreneurship. *Pace* the pragmatic approach, Packard and Clark propose taxonomizing uncertainty along purely

**Table 2** Conceptual similarities between Knight and Ramsey

| Idea | Knight | Ramsey |
|---|---|---|
| Beliefs individuated to a particular individual | Judgement formation capacities as relative to each agent. | Belief formation capacities as relative to each agent. |
| Desires individuated to a particular individual | Judgement of means of action and execution of planned responses as relative to an agent. | Expected costs of action as relative to each agent. |
| Beliefs as partial or graded | Degrees of confidence | Degrees of belief |
| Beliefs as behavioral dispositions to act | The action chosen by an entrepreneur as a function of her confidence; e.g. the contract case. | The action chosen by an agent as a function of her belief; e.g. the pedestrian case. |

epistemic and ontological lines (Packard and Clark 2019). Unpacking their view begins with an assessment of the terminology they deploy which enables their carving of the following two key distinctions. First, "mitigable uncertainty" is that which can be resolved by the agent acquiring further information whereas "immitigable uncertainty" is insensitive to the agent's acquiring further information. Second, epistemic uncertainty can be defined as ignorance of relevant knowledge which is "knowable in principle" and is thus mitigable whereas aleatory uncertainty is defined as uncertainty ranging over ignorance generated from a process involving "a priori causal indeterminism" and is hence immitigable (Packard and Clark 2019: 11). On this view, uncertainty is typed solely by the epistemic possibilities for its resolution open to the agent –i.e. mitigable vs. immitigable– given the causal or ontological nature of the process –i.e. whether the process is causally deterministic or indeterministic– which underscores the decision situation.

This view enjoys the advantage of making the identification of boundary conditions for uncertainty depend purely on epistemic and ontological considerations. As such, their view does not make the partitioning of uncertainty relative to the particular agent in question. The sequestration of agential and pragmatic features of the decision situation from the diagnosis of the kind of uncertainty at issue results in a simpler agent-neutral delimiting of uncertainty. This can be spun into an objection against the pragmatic view of uncertainty we propose: if cleaner, agent-neutral boundary conditions for uncertainty can be established by omitting pragmatic features, why opt for a messier, agent-relative pragmatic view?

By way of response, the viability of Packard and Clark's boundary conditions has engendered scrutiny: specifically, their distinctions are inexhaustive and can be cross-cut given the possibility both for mitigable aleatory and immitigable epistemic uncertainty (Holmes and Westgren 2020; Arend 2020). If their view leaves us only with fuzzy rather than sharp boundary conditions, its diagnostic value falls into doubt. Certainly, prescriptive impotence is too heavy a cost to bear for simplicity.

Deeper problems for Packard and Clark's view, however, emerge regarding both the account's descriptive accuracy and normative value. Concerning descriptive accuracy, Packard and Clark circumscribe uncertainty on purely epistemic and ontological lines. Epistemic uncertainty is ignorance of knowledge which is knowable in principle; where knowledge is taken to be a purely epistemic state of the agent, without regard to any pragmatic features of the decision context such as the pragmatic costs of the agent's being wrong. This stance on knowledge which is referred to as *epistemic purism* amounts to the claim that knowledge is insensitive to pragmatic factors, a view which is by no means uncontroversial (Fantl and McGrath 2007). For views that exhibit epistemic purism, knowledge is determinable only by truth-relevant factors such as truth and justification where the latter is the degree to which the agent is justified in their belief about some proposition. Recently, the view that an agent's justification for some belief, where justification is a putatively epistemic state, is partially constituted by pragmatic considerations such as the costs the agent may incur by being wrong has gained considerable influence in analytic philosophy. (Stanley 2005; Fantl and McGrath 2009; Weatherson 2005). This view is known as pragmatic encroachment. To give an example of how pragmatic encroachment and epistemic purism differ with respect to knowledge, recall the earlier Dutch Book problem for irrational beliefs; if an agent holds a set of beliefs that violate the probability axioms or are irrational, they are subject to having sure-loss contracts designed against them. For epistemic purists, the possibility of having a sure-loss contract made against you just indicates that your beliefs are pragmatically irrational but not epistemically irrational (Weirich 2011). After all, the fact that your beliefs will prove financially

ruinous to you is not an epistemic strike against them but rather a pragmatic one; financial ruin is a negative pragmatic consequence but has no implications per se for how your set of beliefs relates to truth. Indeed, situations can easily be imagined in which it is pragmatically irrational for an agent to hold some belief but nevertheless that belief is true. For the proponent of pragmatic encroachment, pragmatic considerations such as having a sure-loss contract made against you are directly embedded into an agent's justification for her belief. Epistemic states such as justification and knowledge are not disjoint from pragmatic considerations per the epistemic purist but are rather amalgamated together on pragmatic encroachment.

The plausibility of pragmatic encroachment can be established further by considering the following two cases. In the first, some agent desperately needs to catch a train on time in order to attend an important, career altering job interview whereas in the second, the agent would like to catch a train on time to take a casual trip but will simply drive if she misses the train. Both agents possess identical evidence or justification for their belief that the train leaves at 10 AM. However, the stakes or costs of being wrong for the first agent are obviously far higher than those for the second. For the epistemic purist, the fact that the agents possess identical evidence or justification for their beliefs implies that the agents hold epistemically equal positions about the time of the train's departure. *Pace* the epistemic purist, pragmatic encroachment implies that the first agent may not be justified in believing the train leaves at 10 AM whereas the second is justified. These diagnoses owe to the radical differences in the pragmatic utility of the outcomes for each agent: the first stands to lose far more than the second. These pragmatic differences for the agents encroach directly on their respective epistemic positions as regards the justification of their beliefs. The first may lack justification whereas the second may in fact be justified in her belief. Contra the epistemic purist, a non-truth relevant factor directly impacts the knowledge of the agents in this case.

We embrace the spirit of pragmatic encroachment in holding that an agent's justification in, and thus knowledge for, a proposition are sensitive to pragmatic considerations. The implication of this view is that the epistemic purism of Packard and Clark misses the point of judgment under uncertainty. If knowledge is not a purely epistemic norm, but is sensitive to pragmatic features ( agential costs, preferences, and so on) then it is not possible to sequester knowledge from pragmatic considerations. And absent this possibility, Packard and Clark's boundary conditions clearly rest on false foundations. Additionally, the descriptive implausibility of the view has implications for the prescriptive value of their account. If purism requires the sequestration of knowledge from pragmatic factors, then the view has limited instructiveness for agents facing uncertainty in the real world. This is a particularly problematic blow to the purported aim of their view as being relevant to decision-making under uncertainty in entrepreneurial contexts.

By contrast, the pragmatic view which we draw from both Ramsey and Knight is consistent with the notion of pragmatic encroachment on the ontology and epistemology of uncertainty. We not only grant that pragmatic features of the decision situation such as the particular agent's costs and preferences are relevant to that agent's knowledge, but encode these features directly into the identification and resolution of uncertainty. Realism is chosen over idealism and a messier picture of uncertainty is selected over an albeit simpler but false picture.[7]

[7] This calls to mind H.L. Menken's claim that "for every complex problem, there is a solution that is simple, neat and wrong."

## Institutions for Mitigating Uncertainty

Exercising judgment in making investments given the uncertainties surrounding prices, costs, and other economic variables is the *sine qua non* of Knightian profits. As we discuss above, entrepreneurial action shares features of Ramsey's bets under partial beliefs. In this section, we make two important claims. First, we examine entrepreneurial beliefs and the confidence of the entrepreneur in those beliefs with respect to analogues of Ramsey's "distance d" – the cost in time and effort to cross the open fields to update the *a priori* choice of the road to be taken or to increase confidence in that choice. The economic analogue is spending time, effort, and financial resources to mitigate uncertainty by obtaining knowledge. The entrepreneur assesses confidence in their conjectures against the costs of obtaining new knowledge to mitigate epistemic uncertainty through market research, prototyping, and other forms of experimentation. Second, we demonstrate how these institutions provide a way to mitigate uncertainty by a consolidation of cases. We depart from Packard and Clark (2019) by considering methods to mitigate uncertainty by purchasing protection from negative outcomes of the entrepreneurial decision. In the category of uncertainty mitigation, we would include Knight's methods for *meeting* uncertainty: insurance, futures markets, leasing, and venture capital. Insurance and futures markets combine both of Knight's categories of strategies for mitigation, consolidation and specialization, while leasing and venture capital are two forms of specialization.

Knight identifies fundamental methods to mitigate uncertainty: (1) consolidation or grouping of uncertain events, (2) specialization vis-à-vis types of uncertain events, (3) diffusion of potential losses across numbers of underwriters, (4) increased power of prediction, and (5) control of the future (see Knight 1921, p. 239). The first three are important foundations to insurance and underwriting. Underwriting against business losses uses defined risk pools (grouping and specialization) and a sufficient number of primary underwriters and reinsurers to spread potential losses (diffusion). The history of life insurance has been driven by improvements in actuarial science (power of prediction), as well as grouping. The mutual insurance companies rely on specialization and diffusion, so as to match scope of potential losses of a particular type with a sufficient premium base. Knight uses these fundamental methods to consider entrepreneurial and corporate responses to perceived uncertainty, particularly with respect to the institution of insurance.

Knight has a brief discussion of institutionalized uncertainty mitigation tools to "eliminate the chance of loss or gain due to changes in the value of materials used in his operations during the interval between the time he purchases them as raw materials and the time he disposes of them as finished product, 'shifting' this risk to the professional speculator" (Knight 1921, p. 256). The hedging contract Knight refers to is an element of an institutionalized market for mitigating uncertainty – the futures market. By the time *RUP* was written, futures markets had existed in many commodity markets in the US for a quarter-century or more (Hieronymus 1977). The key to uncertainty management is the evolution from the forward contract, where a buyer and seller of grain agrees to a quantity to be transacted at a specific time for a specific price, to a secondary market where sellers and buyers of grain could sell their side of a forward contract to a third party who saw a chance for gain in meeting the terms. That is, if the third-party speculator believes that the actual market price for the grain at the time the contract is fulfilled will be lower than the contract price, they will buy the forward contract obligation of the original seller for an agreed price and fulfill the contract with lower cost grain. The final evolutionary steps were completed with the development of clearinghouse operations, which

meant the speculator never had to locate, buy, and deliver the grain to fulfill the contract. The speculator could close out their obligation and claim the actual value gain or pay the actual value loss to the clearinghouse. All of the speculative bets on a price rise and all of the speculative bets on a price decline are offset - the market is "cleared". And, thus, thousands of speculators accept the risk of price declines that disfavor sellers of physical commodities and the risk of price increases that disfavor buyers of physical commodities, like Knight's example.

It may be the case that speculators see price changes as epistemic uncertainty or as aleatory uncertainty. That is, they may make their bet because they have partial beliefs about an impending drought, loss of an important export market, or any other market perturbation that affects quantities to be supplied or demanded and, hence, price. Or they make their bets according to Knight's account of the speculator's specialization as managing hundreds or thousands of trades as an exercise in aleatory uncertainty management.

The institutions, notably the contract specifications, clearinghouse rules, and governmental oversight of futures market exchanges caused an immense growth in futures trading in the second half of the 20th Century. Building on the success of uncertainty mitigation in grain, livestock, and other agricultural products, the exchanges now offer futures trading in currencies, more than a dozen stock exchange indexes, government bonds and notes, interest rates, precious metals, energy prices, and weather. To Knight's point in 1921, the entrepreneur can pay to eliminate or diminish losses due to adverse price changes in everything from raw materials to interest costs to exchange rates.

Between individual action to mitigate uncertainty and institutional tools available to the entrepreneur, we find less formal forms of specialization and consolidation to reduce the scope of epistemic uncertainty. We have examined Knight's identification of both formal and informal institutions for uncertainty mitigation. The former has been represented as a regulated set of specialized, consolidating agents for meeting uncertainty – underwriting insurance contracts and structuring and clearing futures markets. The latter –the use of specialist agents (e.g. venture capitalists) or equipment and land leasing– are unregulated collectives of Knightian specialists offering tools to mitigate uncertainties faced by entrepreneurs. Thus, the role of institutions in Knight's account is: (i) they provide an analogous case to Ramsey's "distance d" pedestrian case for entrepreneurial decision-making under uncertainty; (ii) these institutions present an opportunity to mitigate uncertainty for Knight by the consolidation of cases.

## Conclusion

In this paper, our aims have been three-fold. First, we attempted to restore the relevance of *RUP* for entrepreneurial decision-making under conditions of uncertainty by supplementing the view with Frank Ramsey's pragmatic account of *partial* or subjective beliefs. The supplementation serves to smooth out the confused shuffling in Knight's original work in *RUP* between the internal and external perspectives of entrepreneurial uncertainty. This serves to make the Knightian account clear both with respect to individual agency and the utility of institutionalized uncertainty mitigation. The closeness of fit of Ramsey's account for Knight's view was demonstrated to reside in the conceptual similarities between both authors' view of decision-making under uncertainty: both adopt a subjective view of graded belief which is individuated to a particular agent's cognitive and conative attitudes. Further, both authors take belief to be a causal disposition to act "as if p" were true.

Second, the supplemented Knight-Ramsey pragmatic account was shown to contribute to an extant debate about entrepreneurial decision-making under uncertainty. This account of entrepreneurship under uncertainty deviates strongly from recent literature, in which uncertainty is parsed in several different ways including substantive vs. procedural (Dosi and Egidi 1991), state vs. effect vs. response uncertainty (Milliken 1987), ambiguous vs. fundamental (Dequech 2011), and open vs. closed with respect to choices and outcomes (Packard et al. 2017). Many of these ontologies overlap, but all require one or more (often elaborate) boundary conditions so that one may infer different decision behaviors that can be mapped on the categories of uncertainties. As we discuss above, these approaches require *epistemic purism* that fully discounts individual intentionality of the entrepreneur.

Alternatively, the supplemented pragmatic account represents a deflationary view since it puts aside the issue of drawing determinate boundary conditions between epistemic categories (e.g. types of uncertainty) and refocuses emphasis on the question of entrepreneurial decision-making. The decision maker proceeds with forming a set of subjective graded or partial beliefs about a particular entrepreneurial venture. If the entrepreneur perceives that their beliefs are strong with respect to the preferred outcome, they act. Likewise, if they can increase their confidence by obtaining additional knowledge or by purchasing uncertainty mitigation, they can do so prior to making the investment decision. If the partial beliefs are weak and mitigation is too costly, any remaining disposition to act rests upon hubris. In sum, we dispense with subcategories of uncertainty and even the putative risk/uncertainty boundary and make this an individuated decision based upon subjective evaluation beliefs, outcomes and costs.

This deflationary view is fundamental to explaining some of the interesting issues in management. One is managerial hubris, where decision-makers fail in properly warranting their beliefs or ignore weakly graded beliefs (Sniezek and Henry 1989; Kahneman and Lovallo 1993). Hayward et al. (2006) take the idea we present above as the basis for a model of hubristic venture failure. A second area of current literature is the role of experimentation in strategic management and strategic entrepreneurship in the face of uncertainty (Salge and Vera 2013; Thomke 2003; Kerr, Nanda, and Rhodes-Kropf 2014). Kerr et al. (2014) make the important point that at the societal level, all entrepreneurship is experimentation, and subject to a Darwinian selection process; but at the firm level, new ventures are about experimentation "about the likelihood of ultimate success, [whereby] entrepreneurs and financiers gain information about whether to continue the project" (p. 27). That is, both the entrepreneurs and the venture capitalists are constantly measuring their shared degree of graded beliefs, updated by new experimental evidence that conforms to Ramsey's conjecture about "d". This leads to a third evolving literature on the substance of individuated venture capital contracts for new ventures that reflect these graded beliefs made manifest in control clauses, financial terms, and other conditions of the agreement (Kaplan and Strömberg 2003, 2004)

Third, the analogy between Ramsey and Knight was further tightened by examining the role of formal and informal institutions in uncertainty mitigation for Knight's view. This tightened the analogy in two ways. First, Knight's description of institutions represents the analogue of Ramsey's pedestrian "distance d" case in that institutions offer an avenue for entrepreneurs to reduce uncertainty at a cost. Second, institutions provide a means of diffusing uncertainty by a consolidation of cases. We take Knight's account of entrepreneurship under uncertainty to be pragmatic; it is an individualistic account of agency with respect to a specific entrepreneurial venture. However, we see that a significant element of Knight's approach to

meeting uncertainty is actually collective responses to repeated instances of risks and uncertainties outside the firm. Knight's strategies of specialization and consolidation lead to conventional and institutionalized methods for meeting uncertainty – increasing the strength of, and confidence in, beliefs about venture outcomes at a cost. Insurance premiums, purchase prices of futures contracts, lease contracts, and venture capital contracts all transform uncertainty into operational costs inside the firm. Similarly, if the entrepreneur engages in non-institutionalized or individualized methods for meeting uncertainty there will be costs to assume. Diffusing uncertainty by increasing scale or scope of the corporate enterprise, or by hiring specialists to manage specific uncertainties in production and marketing, incurs costs. Purchasing market research incurs financial and time costs prior to instantiating the new venture. Ramsey's metaphor of arriving at a crossroad while walking is made tangible; rather than expending time and effort hiking across the fields to ask about which road to take, the entrepreneur undertakes mitigation strategy at a cost.

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**Randall E. Westgren** is Professor of applied economics and the McQuinn Chair in Entrepreneurial Leadership at the University of Missouri - Columbia, USA. He works in the areas of strategic and entrepreneurial decision-making with particular interest in the agro-food sector.

**Travis L. Holmes** is a PhD candidate and researcher at the University of Missouri-Columbia. His primary research interests are in the philosophy of science, economic modeling, and decision theory.

## Affiliations

**Randall E. Westgren**[1] · **Travis L. Holmes**[2]

Travis L. Holmes
tlhgyf@mail.missouri.edu

[1] Division of Applied Social Sciences, University of Missouri-Columbia, 141 Mumford Hall, Columbia, MO 65211, USA

[2] Department of Philosophy, University of Missouri-Columbia, 438 Strickland Hall, Columbia, MO 65211, USA