and supportive, as and when required for a variety of purposes including the well-being of individual lives, stable communities, and thriving economies.

This reminds us why we do NOT use instrumental outcome criteria to evaluate the content of other types of education. For example, could science education have developed or even survived criteria such as how many people become scientists? Or worse still, on the criterion of how many invent new technologies or win Nobel prizes? Consider the fact that there was a total of 600 scientists over the first 150 years of science education (Kearney, 1964)! Should core courses in law or accounting or music be judged on the basis of how many people become lawyers and accountants and professional musicians? The aim of good education is for students to actually learn and understand the content and then use that in ways that matter to them. Some of them will go on to become more professional and expert in particular subjects such as science and economics, and a few will even end up winning Nobel prizes or eradicating diseases. In other words, lessons from studies of expertise should be more relevant to the creation of content within a rigorous theoretical framework than deriving content from short-term correlations with predetermined outcome variables.

In that spirit, the theoretical framework below is evidence based and can be tested, validated, modified, and fine-tuned, using methods and measures other than post-hoc surveys of proximal performance outcomes such as whether people started ventures or succeeded in them.

At the Heart of the Entrepreneurial Method: The PC Framework

The PC framework in Figure 2a is at the heart of the entrepreneurial method. The framework is typological in nature (Doty & Glick, 1994). In other words, it goes beyond a taxonomy, defined as a set of mutually exclusive ideal types used merely for classifying instances. Instead, Figure 2a is a typology based on theoretically relevant dimensions (prediction and control) that relate to key dependent variables (such as size or age of firms and the accrual of expertise in entrepreneurs). Furthermore, as typologies typically do, this framework facilitates contingent and interconnected understandings of actual phenomena that cannot easily be classified purely as ideal types.

The PC framework is general enough to capture entrepreneurship as a method à la the scientific method, as expounded in Sarasvathy and Venkataraman (2011). We need to distinguish the notion of "method" both from its applications to a wide variety of phenomena as well as to the content of particular courses and programs built on these possible applications. In science, for example, there are not only multiple curricula and disciplines such as physics, chemistry, and biology and their applications such as in engineering, but the notion of the scientific method also transcends all of these and can be studied on its own. The scientific method consists of a philosophy and a worldview embodied in a framework that includes generalized techniques such as careful data collection, replication, and randomized, controlled experimentation that cut across specialized techniques in physics or astronomy or biology. Similarly, the PC framework of the entrepreneurial method encompasses a worldview about the cocreation of human futures embodied in generalized techniques that cut across applied content in specialized programs such as youth entrepreneurship, life-sciences venturing, or social-impact financing.

Keeping with the generality of the method, the PC framework encompasses a wide variety of ventures—for-profit, nonprofit, social, or hybrid, taking a wide variety of organizational forms such as companies, cooperatives, and even yet-to-be invented structures. However, the framework has two boundaries. It does not include self-employment, and it excludes political structures such as governments and armies, as well as large corporations, even though these can also begin as entrepreneurial ventures and incubate such ventures within their walls. These exclusions

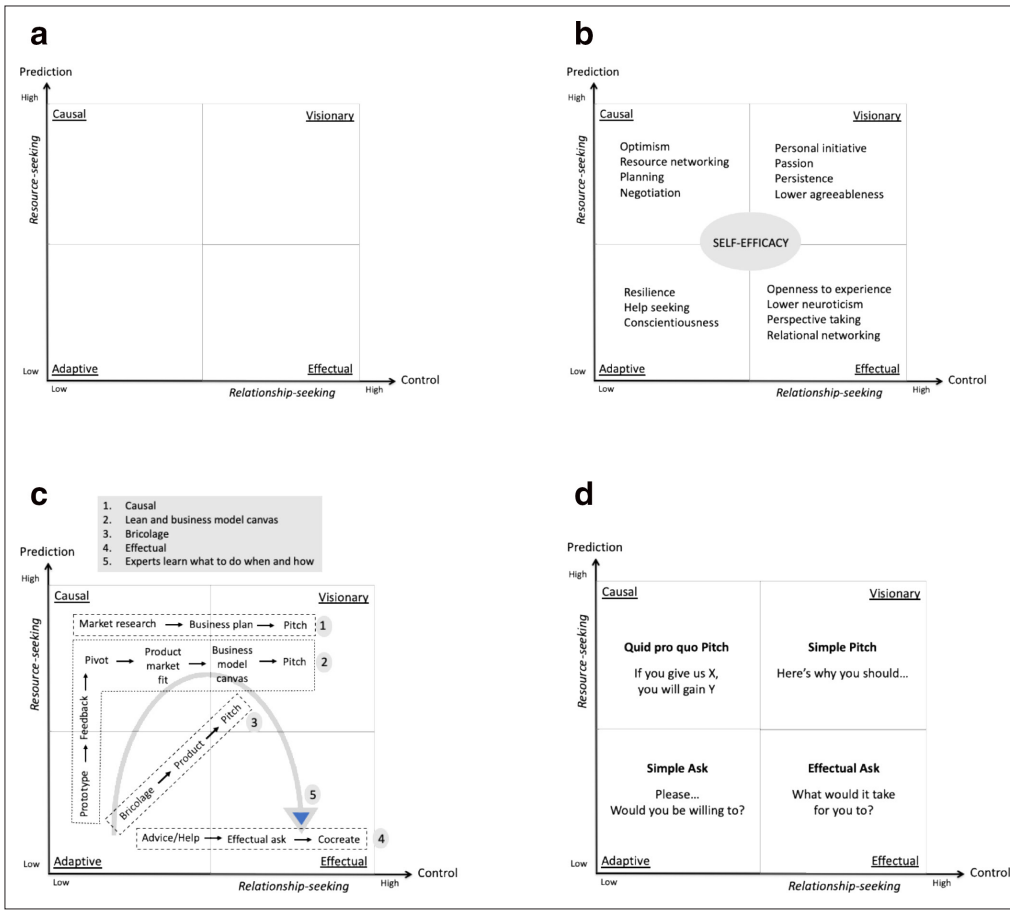

Figure 2. (a) Prediction-control framework. (b) Mapping of psychological variables. (c) Mapping of pedagogical tools. (d) Applied to the ask.

might seem arbitrary and can be relaxed in future research. But for the moment, the bounds are useful for focusing the explication and discussion of the framework.

An outline of the bare-bones PC framework can apply to 3 sets of phenomena of theoretical interest: (1) development of entrepreneurs; (2) development of ventures; (3) development of expertise across multiple ventures over the career of an entrepreneur.

The Bare-Bones PC Framework

Figure 2a depicts the theoretical framework as a modification of the typology outlined in Wiltbank et al. (2006). Derived from Sarasvathy (2001), where effectuation was defined as nonpredictive control, that typology in Wiltbank et al., was limited to strategic decisions within existing organizations. Since then, versions of the typology have been applied to angel investing (Wiltbank et al., 2009) and to the development of entrepreneurial expertise more generally (Dew et al., 2018; Read et al., 2016; Sarasvathy, 2009). In particular, the growing literature stream on causal and effectual actions offers more texture and precision than the nomenclature of planning and

transformation used in Wiltbank et al. For recent reviews of this literature, see Grégoire and Cherchem (2020), as well as McKelvie et al. (2020).

The dimensions of the typology in Figure 2a consist of prediction on the vertical axis and control on the horizontal axis. This offers four quadrants (Adaptive, Causal, Visionary, and Effectual) for organizing entrepreneurial traits, action, and interaction. Although the space can be conceptualized separately or alternately in terms of the actual or perceived predictability and controllability of the future, for the purposes of development here, we can assume the following: the left-hand side of the figure assumes that environment and futures are exogenous to human action; the right-hand side assumes environments and futures can be endogenous. We can make this even more precise by limiting the framework to using more or less predictive information (vertical axis); and leveraging elements more or less within or outside the control of any particular actor/s (horizontal axis). As is usual in theory development, these limitations can be relaxed and nuances added in as appropriate in future work.

Figure 2b: Development of Entrepreneurs

Normally, stable traits and learned behaviors are conceptualized within non-overlapping spaces. However, that is true only in a static view of reality. Over time, traits not only influence learning; they can also be changed through learning, especially learning from experience. In a recent study using 16-week intensive longitudinal randomized experiments, Hudson and Fraley (2015) found that people who wanted to increase any Big Five personality trait not only expressed actual increases in their self-reports of that trait, but also exhibited that increase in trait-relevant daily behavior—over the subsequent 16 weeks. This has been shown to be true not only in cognitive terms, but in neurological (Doidge, 2007) and even genetic terms (Youdell, 2018). Moreover, deliberate practice involved in the development of expertise can deliberately reshape purpose, traits, and even identity (Ericsson & Pool, 2016, p. 172).

Scholars of entrepreneurship education have also highlighted the importance of focusing on the development of entrepreneurs. Dimov and Pistrui (2020) argued for the need to create content that enables first-person transformation in learners. Rahm (2019) showed the importance of curricula that go beyond venture-creation skills to personal and societal engagement through entrepreneurship. Additional empirical evidence for the relative importance of content involving psychological variables over traditional business skill development is chronicled in Campos et al. (2017), Glaub et al. (2014), and Rauch et al. (2005).

As a testament to its generalizability to the entrepreneurial method, Figure 2b maps various psychological (mindset) variables that have been found to be relevant to entrepreneurial action. Figure 2c maps dominant tools and techniques that currently form the content of entrepreneurship venture-development training programs. Together, these show that a wide variety of educational content as well as research findings to date can usefully be mapped onto the framework. Let us dive a bit deeper into Figure 2b and c before proceeding to a fuller discussion of the connection to the development of expertise in 2d.

At the center of Figure 2b is the concept of self-efficacy. There is wide ranging consensus in psychology that self-efficacy is at the heart of human agency (Bandura, 2006) and the exercise of control (Bandura, 1997). As such, it is a variable that could underlie all four quadrants in the PC framework in Figure 2b. Boyd and Vozikis (1994) argued for the role of self-efficacy in fostering entrepreneurial intentions and actions, and Chen et al. (1998) found that it distinguished entrepreneurs from managers. More recently, Zhao et al. (2005) found strong evidence for the mediating role of self-efficacy in the development of entrepreneurial intentions.

In a meta-analysis of the Big Five personality traits in entrepreneurship, Zhao and Seibert (2006) found that entrepreneurs scored higher than managers on Conscientiousness and Openness

to Experience and lower on Neuroticism and Agreeableness, with no significant differences in Extraversion. Arguments for where they can be placed within the PC framework go as follows: when entrepreneurs believe they can both predict and control the future, they are likely to be less agreeable. Conscientiousness does not depend on prediction and control and could be a more generic characteristic useful in adapting to changes externally imposed. Lower neuroticism and more openness to experience facilitate relational strategies needed for effectual cocreation.

Additional psychological variables that have been shown to be of particular interest to entrepreneurship include personal initiative (Glaub et al., 2014) and passion (Cardon et al., 2009, 2013). Moreover, passion is related to self-efficacy and persistence (Cardon & Kirk, 2015). All of these are related to a visionary approach (top right-hand quadrant in Figure 2b) to entrepreneurial action and leadership (Baum & Locke, 2004; Breugst et al., 2012). Resilience shows up at the other end of the spectrum (bottom left-hand quadrant of Figure 2b), allowing entrepreneurs to adapt to changing external forces that thwart a visionary approach (Bullough et al., 2014; Williams & Vorley, 2014). Another variable of interest in the literature related to this quadrant is help seeking, especially useful in adaptive contexts such as those involving user entrepreneurship (Shah & Tripsas, 2007).

The top-left (causal) quadrant in Figure 2b coheres with a large body of work on the role of planning in entrepreneurship, ranging from the theory of planned behavior (Ajzen, 2002) for predicting intentions and actions (Kautonen et al., 2015) to the usefulness of business plans (Delmar & Shane, 2003; Shane & Delmar, 2004). This quadrant can also incorporate contextual and other nuances to planning (Brinckmann et al., 2010; Honig, 2004). It is important to note that planning can be useful not only in terms of predicted changes in demographics, regulations, and technology regimes (Shane, 2003), but also in terms of negotiating and contracting with potential stakeholders from whom entrepreneurs seek resources. In spite of a large and well-developed literature on negotiations, there are surprisingly few publications on negotiations in entrepreneurship (Bazerman et al., 2000). Notable exceptions include Hudson and McArthur (1994) and Artinger et al. (2015) who found that entrepreneurs' (as opposed to non-entrepreneurs') assertive behavior led to fewer agreements—but when they did close a deal, it led to higher profits. Assertive behavior is also associated with optimism and planning—for example, in the evaluation of opportunities under risky conditions (Keh et al., 2002).

In addition to mostly individual-level psychological variables and action behaviors targeting resource acquisition, entrepreneurship research has also examined relational variables that highlight the role of networking behaviors. Although vast, the literature on social networks in entrepreneurship has mostly focused on the structural characteristics of the networks themselves rather than how entrepreneurs form and use networks (Aldrich & Kim, 2007; Di Domenico et al., 2010; Hite & Hesterly, 2001; Leung et al., 2006). However, a small but rising stream of work is beginning to examine agentic and interactional aspects of networking such as tie formation (Elfring & Hulsink, 2007) and relational matching (Vissa, 2011). Scholars have also studied networking from an effectual perspective (Coviello & Joseph, 2012; Galkina & Chetty, 2015). For a recent review of this stream, see Kerr and Coviello (2019). This stream maps well onto the bottom-right quadrant of Figure 2b.

Figure 2c: Development of Ventures

While it appears that all extant entrepreneurship educational content can be placed within the PC space, Figure 2c maps only a few exemplars used in entrepreneurship courses in universities. Except for bricolage, effectuation (Fisher, 2012), and training for psychological attitudes, contents of educational and training programs are not sourced from entrepreneurship research. Instead, tools such as Lean Startup come from best sellers based on impressionistic and

anecdotal observations from Silicon Valley not subjected to peer review (Blank, 2013; Osterwalder & Pigneur, 2010; Ries, 2011). Nevertheless, these are widely used in current entrepreneurship curricula. Hence, it is a useful exercise to fit them within the PC framework to show its generalizability. Figure 2c shows that the framework is adequate to incorporate all of these and more. Given the generalizability of the PC framework to the entrepreneurial method, it might be time to dive deeper into the question: Why do all of these fit into the framework?

Dimensions of the PC Framework

The generality and comprehensiveness of the PC framework is directly related to the context of entrepreneurship within the history of ideas. Starting with the seminal work of Frank Knight, scholars have increasingly noticed and embraced the centrality of uncertainty as the pervasive and defining characteristic of the entrepreneurial setting (Knight, 2012 [1921]). In fact, this centrality has recently come to characterize the very zeitgeist of the 21st century, propelled by the fast pace of changing technology (Boettke, 2010; Jones, 2005). Even management scholars are beginning to acknowledge the power of this dimension (Alvarez et al., 2018). The horizontal axis of control is equally central to entrepreneurship (Mueller & Thomas, 2001; Peterson et al., 1993; Sarasvathy, 2009; Seligman, 2006).

The two dimensions of the PC framework also offer an interesting and inverse link of the entrepreneurial method to the scientific method. Prediction is the touchstone of science. The ability of science to predict is rooted in invariable "laws" of nature in the physical universe (Mirowski, 1991). And the aspiration for better predictions is related to the aspiration to gain control over our future (Tetlock & Gardner, 2016). The entrepreneurial method suggests equally strong links in the reverse direction (Sarasvathy & Venkataraman, 2011). Entrepreneurial expertise is rooted in action and interaction resulting in additional toolboxes for tackling uncertainty beyond predictive strategies based on a scientific approach (Alsos et al., 2020; Sarasvathy, 2009). Note that the point here is not to diminish the role and efficacy of predictive approaches but to expand possibilities through nonpredictive control-based (effectual) action. In sum, the PC space is simply the interface between human agency and Knightian uncertainty—hence its ability to incorporate all of entrepreneurship research as well as practical toolboxes.

It is necessary to acknowledge that Figure 2b and c may not be complete or comprehensive. However, it is also easy to see that the PC space can accommodate an even wider variety of entrepreneurial phenomena than can be elaborated within the scope of this article. For example, the framework can account for extant literature on opportunities. The recognition and discovery of opportunities relate to prediction and the creation and cocreation of opportunities to control (Alvarez & Barney, 2007). Similarly, the framework can explain the development of expertise over time.

Figure 2d: Development of Expertise

The PC space need not be a static framework. We can also consider moving through the space over time. For example, we could map life cycles of ventures and careers of entrepreneurs starting in one or another quadrant and moving toward or away from the others. Exploring the dynamics of the space can capture entrepreneurial learning (Minniti & Bygrave, 2001), learning through experience (Politis, 2005) as well as the development of expertise through deliberate practice (Dew et al., 2018). Exploring and extending the space dynamically will be necessary in formulating modular advances in entrepreneurship curricula from elementary schools to graduate programs and beyond. In fact, expertise in entrepreneurship consists of developing nuanced judgment about matching different parts of the space to strategies that fit each part (Jiang &

Tornikoski, 2019; Reymen et al., 2015; Smolka et al., 2018). Such judgment would be learned through better calibration of the objective spatial contexts of predictability and controllability at any given point in time while also learning to match subjective perceptions, actions, and intersubjective interactions and reactions to shape those contexts over time. This notion of better calibration leading to better matching is illustrated in Figure 2c through the curved arrow moving through all four quadrants.

However, given pervasive uncertainty in entrepreneurship, even an expert entrepreneur may not always be able to accurately calibrate which part of the space they find themselves in. In those cases, experts can still exert control through a proactive precommitment to a Type I (perceiving the context as predictable when it is not) or Type II (treating the context as unpredictable when it is actually predictable) error. Similar errors can occur with regard to what entrepreneurs deem to be within or outside their control. It has been argued that when in doubt, expert entrepreneurs choose Type II errors, proceeding as though the context is unpredictable (Forster & Sarasvathy, 2020; Sarasvathy, 2012). This choice of errors leads them to a strong preference for the bottom-right quadrant of the PC space.

One of the simplest yet most ubiquitous behaviors in entrepreneurship can be used to illustrate how this works in practice. The behavior I am referring to is the "ask." On a daily basis, entrepreneurs have to ask others for everything from advice and help and feedback to a variety of resources such as money, time, knowledge, and networks. "Others" includes not only investors but all actual and potential stakeholders, such as employees, suppliers, customers, and even family and friends. Dew et al. (2018) have shown that the ask is a fundamental unit of deliberate practice in the development of entrepreneurial expertise. Figure 2d illustrates how the ask could be mapped onto the PC space. The top quadrants can be addressed through two variations on the pitch. Note that a pitch is a specific kind of ask, usually targeting specific stakeholders for specific resources. The simple pitch consists of reasons why someone should invest in the venture or provide resources to the venture. A deal structure consisting of a quid pro quo such as "$2 million for 30% of the company" could also be added to the simple pitch. The bottom two quadrants may be approached through more general conversations involving asks to anyone and everyone, not only to specific stakeholders. Asks can be relatively simple, as in normal conversational requests such as, "Please, would you be willing to…?" Expert entrepreneurs learn to use a more open-ended and cocreative version of the ask that invites people to self-select. Their asks usually take the format of "What would it take…?" Note that this format allows the other person to tell entrepreneurs what their pitch should be, thereby both relieving them of the need to predict it as well as allowing others to self-select into the venturing process on cocreational terms. For a detailed development of asks within a larger study of entrepreneurial interactions, see Sarasvathy (2021).

How the Entrepreneurial Method Can Build the Middle Class of Business

As a last step in the development of the PC framework, we can integrate it into the basic argument for the middle class of business as laid out in Figure 1. Simply combining the bottom half of Figure 2d into Figure 1 gives us Figure 3 that depicts how entrepreneurship education can move the current frontier of the size distribution of firms to the building of a middle class of business. Note that the aim here is not to change regulatory incentives or competitive dynamics. Simply adding widespread education based on the entrepreneurial method can help grow a small percentage of employer firms in ways that enable them to endure a lot longer.

As we saw earlier, history showed at least three mechanisms connecting the scientific method to the rise of the middle class. First, it severed the link between divine revelation and the creation