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Randall Morck

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Randall Morck

ECONOMICS: MORE THAN A SCIENCE

ABSTRACT: *Economics explains human prosperity as arising predominantly from a process of creative destruction: Successions of innovators create new wealth by conceiving and developing new higher productivity technologies that destroy, partially or completely, the wealth built by their predecessor technologies. Because higher productivity is, by definition, the production of more or more valued outputs from less or less costly inputs, creative destruction increases wealth over the long run. Economic models, in hopeful emulation of the natural sciences, are built from quantifiable probabilities and outcomes. However, new technologies are new creations of human minds, previously unconceived, let alone assigned probability distributions over well-defined outcomes. Economics must be more ambitious. Economics seeks to explain not merely decision-making in an expanding space of conceivable probabilities and outcomes, but decision making that causes that expansion. Behavioral economics reveals that humans rarely think in terms of quantitative probabilities and outcomes, but typically use narrative decision-making. Confronted with a problem, humans formulate a response by recalling and recombining narratives – actual or learned memories of problems, responses and outcomes, each triad with an emotional weight. New narratives arising as*

Randall Morck, rmorck@ualberta.ca, Professor, Alberta School of Business, University of Alberta, Edmonton AB, Canada T6G 2R6

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recombinations of existing narratives, and economically selected for higher productivity, potentially explains combinatorial economic growth.

Keywords: *Endogenous Growth; Narrative Economics; Economic History; Knightian Uncertainty; Philosophy of Economics.*

Amar Bhidé (2025) provides a thorough overview and insightful criticism of a vast body of research on entrepreneurship. I agree with most of his views, so I focus on a few areas where he has perhaps not pursued his quarry to ground. After describing how economics fails to provide adequate ways of explaining entrepreneurship, Bhidé sketches out what he calls a *modernization agenda* for rethinking entrepreneurship. While I largely concur, I suggest that particular aspects of Bhidé's modernization agenda are probably especially important and might be furthered with ideas currently circulating in heterodox circles of finance.

Reading Bhidé, one ponders how economics came to resemble the Monty Python paleontologist's "Theory of Dinosaurs" – they are thin at one end, thick in the middle and then thin at the other end. A theory that is entirely correct within its parameters without being all that helpful. Sciences such as quantum physics, statistical mechanics, thermodynamics and molecular biology are built atop foundations of formal probability theory, and are both correct and useful. Mainstream economic models, built on like foundations, struggle to be useful, especially when explaining entrepreneurial activity, innovation, and progress. Narrative economics now looks like it could be useful, despite having jettisoned probability distributions. Entrepreneurship is about probabilities and outcomes that are not merely unknown, but unimaginable until they happen.

1. *How Economics Fails Entrepreneurship*

Bhidé (2025) is almost surely right about the importance to this issue of the profound mismatch between probability theory and actual decision making by humans. Outside casinos, and even within them, few real human decisions use quantifiable risk. The reader may wish to list the times they made a career move, bought a house, married, had a child, chose a toothpaste, or invested in a stock by assigning a numerical probability and value to every possible outcome and maximizing the expected

value. For almost all humans, including economists, that list is the empty set.

Introspection is autobiographical narrative and, as Bhidé convincingly argues, narratives can be more convincing than deductive logic. Using economic theory to make an economic decision requires doing mathematics and, as Teen Talking Barbie was pilloried for correctly pointing out: "math is tough" (McCLary 2004). Consider the patron looking through a fine restaurant's menu offering twenty appetizers, twenty entrees, twenty desserts, and twenty wines, combinatorically a total of one hundred sixty thousand three courses with wine possibilities. If the patron's expected utility for each obeyed a simple probability distribution defined by a mean and variance, the patron need only calculate three hundred twenty thousand numbers to decide what to eat. If calculating each takes one second, calculating them all takes about 89 hours, by when the patron risks possible malnutrition and certain ejection by any respectable *maître d'*.

As was sadly commonplace, Talking Teen Barbie's wisdom was disparaged while Herbert Simon (a male) won the Nobel Prize for saying largely the same thing: mathematical calculations require time and effort, and are therefore economically costly. Simon (1955) argued that humans "satisfice" - that is, they expend time and effort on probabilistic calculations up to the point where the marginal cost of further mathematical accuracy exceeds the marginal cost of being somewhat wrong. This somewhat downplays the problem of how humans know the costs of being wrong if they don't know the right solution. Humans presumably work harder on the probabilities if they find the decision weightier, but finding that weight is itself presumed to be a result of calculations using probabilities and outcomes.

Keynes (1936, 152) builds macroeconomics upon an outright rejection of the viability of probabilistic decision-making, observing that "our existing knowledge does not provide a sufficient basis for a calculated mathematical expectation." Bhidé argues humans, confronting the unquantifiable uncertainty that shrouds their futures, fall back on routines, often constructed around narratives.

Granting Bhidé to be correct in questioning the usefulness of probability theory, several questions may merit extensions of his work. First, does it matter? Milton Friedman (1953) likenes economics to billiards, which is governed by classical mechanics – the laws of the conservation of momentum, angular momentum and kinetic energy. The

successful but innumerate pool shark behaves "as if" he were solving systems of equations based on these laws. If economic decision makers behave "as if" they were continuously performing probability calculations, is understanding their actual thinking of academic interest only?

The question is far from academic because economic models, which Hansen and Sargent (2010, 1099) define as probability distributions over sequences of economic variables, are built along lines orthogonal to the biggest question in economics, the underpinnings of sustained prosperity. Rational expectations models, which they (ibid) elaborate "deliver empirical power by imposing a 'communism' of models: the people being modeled, the econometrician, and nature share the same model, that is, the same probability distribution over sequences of outcomes" lock in the misalignment.

Bhidé makes this point by calling for a better understanding of the behavior of entrepreneurs, whose decisions are fundamentally acts of imagination unsupported by probability distributions. He posits a theory of what entrepreneurs actually do: decision-making in terms of routines derived from narratives. Bhidé provides a thorough description of this area, to which I can add little.

I therefore suggest possible extensions by drawing from behavioral economics. Bhidé rightly criticizes recent work in behavioral economics for sacrificing its potential to gain mainstream acceptance. Behavioral economists, having amassed what Liu et al. (2022) call a "zoo" of biases, enthusiastically join the mainstream in scolding actual humans for not behaving as mainstream economists' mathematical models say humans ought to behave. Economists, whom Robert Clower calls second-rate mathematicians, must grasp elitism where they can (Snowdon 1998, 196).

Less toffee-nosed economists are instead exploring the neglected borders between behavioral economics and evolutionary psychology. Bhidé (2025) draws from Shiller's (2020) narrative economics, which describes human behavior as shaped by contagious narratives that arise, mutate and recombine randomly, spread logistically, and survive until displaced by new narratives. Bordalo et al. (2020, 2023, 2024) draw from psychology to cast human decision-making as memory searches for conditionally useful narratives. Lo (2017) draws from evolutionary psychology to describe how competitive pressures select for narratives that deliver and suppress narratives that do not. Recombining these and other heterodox perspectives perhaps has a higher probability of

explaining human progress than have mainstream economic models, though this too is hardly quantifiable.

2. The Purpose of Economics: Explaining Previously Unimaginable Progress

Progress is awe-inspiring, and this is why entrepreneurship research is a melee of the awesome and the awful. The awesome comes into focus when one reflects that, just a few generations ago, information moved at the speed of horses or sailing ships, slavery was a deeply established institution, violence was routine, life expectancy was low, poverty was near universal, and democracy was an arcane footnote in ancient history. Now, average people live lives unimaginable to their ancestors.[1] Modern life is hectic, but offers by populist politicians, and ideological extremists to return us to life amid death, filth, disease, and illiteracy have few takers - and they soon live to regret their credulity. Illegal immigration from high-income economies to economies that conserve widespread poverty is also scant.

The central problem in economics is how humanity can put this dreadful past ever farther behind. Indeed, Robert Lucas (1988, 3) remarked that once one starts thinking about economic development "it's hard to think of anything else." Yet before the modern era, modern prosperity was unimaginable. This is Bhidé's (2025) point of departure from mainstream economics – that entrepreneurship is more about imagining than about calculating. His modernization agenda further explores and elaborates this basic idea. The historical scale at which humans escaped abject poverty in recent centuries is why these issues are profoundly important.

Our high and rising standards of living result from technological progress – or more broadly, from innovation. Solow (1957), and subsequent work, shows ongoing innovation explains almost all of the increase in prosperity that large, high-income economies have experienced (Jones and Summers 2022). Productivity-enhancing innovation has two flavors: Product innovation uses the same old inputs to produce more of more valuable outputs. Process innovation produces the same old outputs from less or less costly inputs. Either way, innovation wrests ever more from ever less.

Technological progress is exponential. Moore's Law describes exponentially declining semiconductor unit costs alongside exponentially

increasing semiconductor production over several decades. Numerous other fundamental technologies – canal networks, railways, electrification, automobiles, aviation and others - exhibit similar exponential effects (Nagy et al. 2013). Economic historians refer to this as Wright's Law, after Theodore Wright (1936), an aviation engineer unrelated to Orville and Wilbur who observed exponentially falling costs and exponentially rising output in aviation.

Long-run exponential productivity growth is a summation of individually short-run bursts of growth associated with specific innovations. Each individual innovation displays logistic growth: An initial phase of near exponentially decreasing costs and exponentially increasing scale that soon level off. The exponential effects derive from a combinatorial spillover process whereby innovations make each other ever more productive, including innovations in other industries and countries (Jones 2023). Exponential cost declines drive exponential scale increase until the pace of cost reduction from a specific innovation slows as its economy-wide take-up nears completion and yesterday's innovation becomes today's standard practice (Lofti et al. 2014). Wright's Law applied to a sequence of innovation, each dependent upon previous ones, and each growing exponentially and then leveling off, generates the sustained long-run exponential aggregate growth that makes the present unimaginable to the past.

Asked to name the greatest invention in history, Albert Einstein responded: "compound interest." Many introductory finance textbooks report this as a humorous quip, and Einstein may have intended it so. Compound interest calculations fill boring problem sets, corporate power point presentations, and government bureau forecasts. But compound asset returns are possible only because of sustained exponential productivity growth in the real economy. As elsewhere, Einstein was onto something unimaginable.

3. Rigor and Mortis in Economics

The 20th century recast economics from paragraphs to equations (Bhidé 2025, c5 §3). Arguing in equations has the advantage of forcing economists to clarify their thoughts but the disadvantage of forcing complicated concepts into simple equations. But clearer and simpler is not always better. As Einstein said, "a model should be as simple as possible, but no simpler." Expressing things as simple equations means MBA students

can be taught that a capital investment project is financially viable if and only if its expected internal rate of return, i, exceeds its expected cost of capital, k, and learn to solve for both variables using an array of standard equations.

These equations derive from economic models, which are probability distributions across outcomes of optimizations – usually of humans' expected utility and firms' expected profits - constrained by boundary and equilibrium conditions. The equilibrium conditions usually assume rational expectations – that is, Hansen and Sargent's (2010) mathematically elegant, but cognitively implausible, "communism of models": everyone everywhere all at once thinking the same thoughts.

Mathematics, laments Heilbroner (1979, 196), gives economics both rigor and mortis. First, humans inexorably pulled towards higher utility resemble iron-filings inexorably pulled towards a magnet. Mainstream economics has no need for free will, imagination, or other such unnecessary assumptions. Second, assuming everyone everywhere all at once thinks the same thoughts means any values of i and k that emerge are common knowledge. Any MBA graduate who finds a project with $i > k$ knows her peers at other firms see the same thing. Anticipating this, every MBA graduate advises her firm to lower its prices to undercut the others. They all do so, and keep doing so until their prospective projects' expected internal rates of return are all at or below their expected costs of capital. By *reductio ad absurdum*, $i \leq k$ for all investment projects and none are more than marginally viable. In particular, there is no profit in innovating because others will too and competition will render all innovation worth nothing.

Human beings might perhaps be more complicated creatures. Firms do invest in innovations with $i > k$. Indeed this underlies the technological progress that lifted living standards dramatically over the past few.

To reconnect with reality, mainstream economic models must be tweaked into delivering exponential growth. Lucas (1988), Hansen and Sargent (2010) and most mainstream of economics attach exponentially increasing stochastic technological change terms to production functions. This indeed brings exponential growth into the models, but exiles its source outside the models. Other economic phenomena can be modelled, but Lucas's (1988) problem – the source of sustained economic growth – can be safely stored in a black box.

Endogenous growth theory (Aghion and Howitt 1992, 1997) is a major advance that assumes innovations are initially not common

knowledge, so innovating firms invest in and profit from innovation. Elaborations vie to account for spillovers – that is, innovations' power to magnify each other's value. Economic models of idea generation, in which new ideas arise as recombinations of old ideas, also give rise to exponential economic growth (Weisman 1998; Buera and Lucas 2018; Jones 2023). However, these approaches still model economic growth as optimizations across known probability distributions. Bhidé expresses skepticism that any such approach can capture the essence underlying economic growth. Like the introspective reader and restaurant patron above, he argues, creative entrepreneurs do not think in terms of probabilities and outcomes.

4. Past and Future Tensions in Economics

There is also a tension in how mainstream economics conceptualizes the relationship between past, present and future. This is because, just as the present was unimaginable in the past, the future is unimaginable in the present. This poses an epistemological problem of considerable importance to economic models. The mathematical superstructure of economics sits atop probability and statistics. Bhidé (2025, 5) warns us of the weakness of that foundation, as have many of the deepest thinkers in economics.

Keynes (1921, 233) expands upon Knight's (1921) distinction of "risk" wherein outcomes are quantifiable and obey a known probability distribution versus "uncertainty" wherein outcomes are previously unimagined. Drawing balls from urns carries risk, the advent of a previously unimagined new technology or consumer fashion carries uncertainty. Keynes (1921) subdivides Knight's risk category between cases with frequency probabilities, observable as fractions of repeated random events, versus subjective probabilities, unobservable mental guestimates.

Knight's (1921) risk versus uncertainty terminology is awkward because the words are synonyms, even in economics. Economics and finance textbook sections entitled "decision making under uncertainty" reliably cover decision making under what Knight calls risk. Taleb (2007) calls Knight's uncertainty "black swan" events, recalling how no one conceived of black swans until one was found on the opposite side of the world. In an excellent overview of the ubiquity of Knightian uncertainty throughout Economics, Kay and King (2020) adopt the term "radical uncertainty." I shall adopt this term.

Probability and statistics arose historically to explain games of chance, in which probabilities are observable frequencies. Each side of a fair six-sided die comes up one sixth of the time and observed frequencies in repeated rolls verify probability of one-sixth. Extrapolating from games of chance, mathematicians and statisticians have built a rich superstructure of theory in which bell curves, power distributions, and other patterns arise as limits and hypotheses framed as expected frequencies can be calibrated. Economic models mostly rest atop this superstructure, and assume probabilities are measurable quantifies a kin to frequencies.

This assumption is problematic for many reasons. Few economic variables are observable as repeated draws from a given distribution. Conditions change, shifting underlying probability distributions so present and future realizations can come from entirely different random process than those represented by past outcomes. If those shifts are assumed to obey deeper probability distributions with discernable parameters, a frequency interpretation can, with qualifications, be rescued. But what if those parameters also shift? Moreover, many economic variables are relatively brief time series of highly autocorrelated observations, which provide scant information about distributional parameters, let alone the parameters of random parameters. Interpreting probability distributions associated with economic models as frequencies is thus rather a flight of fancy.

Consequently, subjective probability distributions, proposed by Keynes (1921) and developed into Bayes' Law, have become standard. Subjective probabilities need not correspond to frequencies of observed outcomes. They are subjective measures of belief. This can be formalized as a Gödel logic (Dummett 1959; De Finetti 1974; Preining 2010) in which truth ranges from zero (impossible) to one (certainty), with intermediate values representing intermediate levels of truth.

Keynes (1921, 4) worries that subjective probabilities have a fairy tale flavor: "A proposition is not probable because we think it so." Subjective probabilities attached to traded assets must satisfy the Ramsey-de Finetti Theorem, a condition akin to the Fundamental Theorem of Asset Pricing (Nau 2001). This gives subjective probabilities a financial interpretation and thereby ingress to economic models.

Keynes' (1921) deeper concern is the ubiquity in economics of radical uncertainty. The absence of grounds for ascertaining either frequency or subjective probabilities, and the sheer infeasibility of assuming people

continually work through permutations and combinations of probabilities and outcomes, therefore relegate almost all of economics to radical uncertainty. Keynes (1936, 82) declares: "human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist."

Mainstream economics has two ways of dealing with radical uncertainty. One approach argues that cases of radical uncertainty do not exist. Milton Friedman, citing Savage's (1954) work on subjective probabilities of tradeable asset, concludes that economists "may treat people as if they assigned numerical probabilities to every conceivable event" (Bhidé 2025, 52). However, Savage's theory of subjective probabilities as traded assets does not generalize to radical uncertainty because conceiving of a market for unconceivable probabilities and outcomes seems unconceivable.

The other approach finds ways to recast radical uncertainty as a kind of quantifiable risk. For example, LeRoy and Singell (1987) recast radical uncertainty as risk associated with information asymmetry. Hansen and Sargent (2022) alternatively recast radical uncertainty as uncertainty about which of a list of models is true. In both cases, standard model frameworks can be extended to allow equilibrium solutions. Given such interpretations, Arrow's (1951) remark that "Knight's uncertainties seem to have surprisingly many of the properties of probabilities" is understandable. Economists' longstanding tactic for answering an intractable question – misinterpreting it as a tractable question – is no more successful here than elsewhere.

To encompass radical uncertainty, decision-makers' probability distribution might theoretically be presumed to extend across all outcomes, previously imagined or not. One approach is to apply Laplace's Principle of Insufficient Reason: assign a uniform distribution to events whose probabilities are unknown. Thermodynamics takes this approach in assigning equal probabilities to all possible outcomes (configurations of ideal gas molecules in a fixed volume) to calculate entropy (Jaynes 2003, 327-47). However, this requires an unambiguous way of partitioning outcomes into equally probable subsets (Keynes 1921). How this applies to radical uncertainty is tenuous.

Unimagined outcomes might all be assigned a zero (or infinitesimal) subjective probability (Savage 1954). But as Keynes (1921) points out, there are an infinite number of these, so each individual radically

uncertain event has zero probability. These sky castles might describe radical uncertainty algebraically, but do not generate useful quantitative inputs for decision-making. They are perhaps of scant help in understanding entrepreneurship and innovation.

Economic theory thus mostly ignores radical uncertainty. A few economic theory models (e.g. LeRoy and Singell 1987; Hansen and Sargent 2022), redefine radical uncertainty as an upper tier of meta-probabilities and meta-outcomes, beneath which standard economic theory plays out. Neither looking away nor redefining radical uncertainty greatly aids practical business and public policy decision-makers, who must and do make decisions subject to genuine radical uncertainty. An alternative approach therefore, following the lead of psychology, is to study actual human decision making without reference to standard economic models. Here, Bhidé (2025) launches his modernization project by stressing the importance of routines and narratives in actual human behavior.

5. *Human Nature As It Is, Not As We Wish It Were*

Economics purports to harness human nature as it is, greed and all, to lift the economy as a whole. The Soviet Union sought to improve human nature by shaping a "new socialist man" who would act out the exhortation "from each according to ability, to each according to need." This experiment ended badly, the Soviet system collapsing amid rampant shirking and corruption. Free market economics purports instead to harness human gread. However, casting realistically greedy humans as driven by probability distributions across sequences of outcomes reflecting optimization constrained by structural equations and rational expectations equilibriums is, perhaps as much as Soviet sloganeering, forcing human beings to be what they are not.

Once we accept that there is no basis for estimating probabilities and outcomes in making most, perhaps almost all, economic decisions, we enter the realm of Black Swans. Even in situations where potential outcomes are imaginable, unquantifiable probabilities still leave ambient radical uncertainty. If humans do not think in probabilities and outcomes, how do they think? The idea that humans think in stories, rather than in probabilities and outcomes, is not new. Sartre (1938, 39) writes: "A man is always a teller of tales, he lives surrounded by his stories and the stories of others, he sees everything that happens to him through them; and he tries to live his life as if he were recounting it."

Shiller (2020) observes that economists stand largely alone in ascribing human decisions to probabilistic calculations. Rather, Shiller (2017, 967) observes: "Since around the beginning of the twentieth century, scholars from a wide array of disciplines began to think that narratives, stories that seem outwardly to be of entertainment value only, are really central to human thinking and motivation."

Some disciplines – most notably history – present their content almost entirely in narrative form (Carr 1991). Narratives are also important in marketing (Escalas 2007); journalism (Machill et al. 2007); education (McQuiggan et al. 2008); healthcare (Slater et al. 2003); environmental studies (Cronen 1992) and philanthropy (Weber et al. 2006). Even in economics and finance, where research and problem sets cast every decision as subject to quantifiable probabilities, professors reveal their doubts through their actions. In business schools, classes are often organized around case studies – that is, as narratives. If students actually think in narratives, case studies are natural ways of spreading ideas.

Psychologists Schank and Abelson (1977) describe narratives as scripts. Unsure about what to do in an uncertain situation, humans work to recall relevant narratives and then respond by acting out a chosen narrative. Bordalo et al. (2020, 2024) explore a series of related models of narrative-based decision-making in which human memory is a database of narratives, each composed of a cue, a script, and an outcome. A decision-maker, confronted with a need to make a decision – that is, a new cue – initiates a memory scan for related narratives. A remembered narrative is more closely related if its cue is more similar to the current cue, if it is more salient (more readily remembered), and if it is less subject to interference from other narratives. The decision-maker then eliminates narratives with less desirable outcomes until only one remains, and acts out its script. This can be interpreted as inferred probabilities (Bordalo et al. 2023).

This use of narratives extends Sherlock Holmes' maxim "Once you eliminate the impossible, whatever remains, no matter how improbable, must be the truth" (Doyle 1890, 172). Abductive reasoning - choosing the least improbable of a list of explanations – is mathematically logical only if the list is complete. Abductive reasoning from a list of all conceivable explanations is a form of Simon's (1955) satisficing (Bhidé 2025). But unconceivable explorations remain a problem.

Lo (2017) adheres more closely to Shiller's (2020) concept of narrative economics and deemphasizes lists of outcomes and probabilities in favor

of economic selection. Building upon Nelson and Winter's (1983) theory of evolutionary economics, this view posits that humans use decision-making routines cast as narratives and can explain to innovation. Narratives can be mental innovations. They can be experienced, observed, recounted, imagined, or recombined "cue, response, and outcome" triads. Confronted with a need to make a decision, a decision maker scans her memory for potentially useful narratives - remembered, imagined or recombined.

Lo (2017) argues that this search must be emotion-weighted. This is because Damasio (1994) shows neurosurgery patients left unable to feel emotions becoming not as hyperrational adherents to economic models, but chronically indecisive. This is consistent with Keynes (1936, 162) conclusion that "human decisions affecting the future … cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist." Keynes (1936, 161) posits that actual decisions do not reflect such calculations, but instead arise from "a spontaneous urge to action." Keynes called this animating urge "animal spirits." Lo suggests that this urge arises from a memory scan for an appropriate narrative and the acting out of its script.

Narratives are thus stored in memory as cue, script, outcome triads weighted by emotional affect (sign) and valence (strength). Narratives that evoke fear have very strong negative emotional weight because fear activates evolutionary ancient and therefore highly adaptive fight or flight neural circuits. Such narratives can be etched into memory permanently. Narratives that end well are given positive emotional affect by neural circuitry associated with dopamine reinforcement. Random but mainly positive reinforcement appears to give narratives stronger positive valence than does certain positive reinforcement. Narratives entered into memory more recently or recalled more recently have stronger valence. Given the need to make a decision, a memory scan identifies a set of potentially relevant narratives, from which the most emotionally positive one is acted out.

Routines that bring more strongly emotionally positive outcomes are brightened, reinforced, and emulated by others; routines that bring more strongly emotionally negative outcomes are darkened, debased, and avoided by others. Economic selection promotes narratives that increase their own survival odds, which depend on the survival and prosperity of the decision-makers using them.

This account differs starkly from standard economic models. First, the human decision maker assigns no probability distribution to possible

outcomes. The decision is not an optimization, but an emotional ranking of a limited set of retrieved narrative outcomes. Consequently, it presumes no quantified probabilities and outcomes, shared or otherwise, and no mathematical calculations. Second, this account might actually emulate human nature as it is, rather than as we wish it were. In that sense, it reinforces a deeper motif in economic thought – an accurate rather than idealized human nature.

6. Decision-Making by Narrative

Even so, does it matter? Recalling the applied physics expertise of Milton Friedman's pool shark, do decisions made this way sufficiently closely resemble constrained optimization to validate mainstream economic models? In computer science, genetic algorithms, which make decisions in ways not radically different from this, can be extremely fast and accurate ways of solving complicated constrained optimization problems (Kramer 2017). These arguments suggest that mainstream economic models might accurately shadow real economic phenomena. But relying on the deep structures of economic models to craft policy interventions is then mere playing with shadows. In contrast, a more fully developed narrative economics might reveal enough about how underlying mechanisms actually let policy-makers play with whatever makes those shadows. This might be a good thing.

Narrative economics can provide a deeper foundation for the most widely accepted comprehensive theory of behavioral economics, Kahneman's (2011) two-speed decision-making. Building upon Simon's (1955) observation that thinking is metabolically costly, Kahneman posits that humans skimp on it when they can. When needing to make a decision, humans default to "thinking fast." That is, they activate a heuristic, a metabolically inexpensive stimulus-response pattern. Heuristics are reflexive, rather than remembered "cue, response, and outcome" triads. They include rules such as "if rewarded, repeat," or "if frightened, flee." The former is implicated in stock market bubbles - buying into rising stock markets increases one's wealth, so one buys still more – and the latter in crashes – selling everything in frightful panic. Other heuristics such as "follow the crowd," "imitate success," and "obey authority" may likely propel such economic phenomena. Heuristics are quick and easy ways of making decisions – they are how Simon's (1955) satisficing actually works in practice.

Kahneman posits that when "thinking fast" fails to converge, the human mind downshifts into a second more metabolically costly "thinking slow" process. For example, when two rival authorities give conflicting directives, the heuristic "obey authority" no longer converges upon a unique response. In such cases, Kahneman posits that humans pause and expend mental energy thinking about probabilities and outcomes as in economic models. Humans thus do employ economic models of decision-making, but only when satisficing via heuristics does not lead to a decision.

The key problem in Kahneman's two-speed mind is that Knight (1921), Keynes (1936) and Kay and King (2020) remain fundamentally correct. In a real world of rare quantifiable risk and overabundant radical uncertainty, the most exhausting surge of mental effort in assigning probabilities to outcomes and optimizing across probabilities and outcomes seems fanciful when "the basis for making such calculations does not exist" (Keynes 1936, 162).

Narrative Economics readily accommodates an analogous down shifting, but without resort to such fancy. If an initial memory scan fails to identify a single emotionally most attractive narrative, a deeper memory scan might be triggered. Like Kahneman's "thinking slow," ever deeper memory scans are ever more metabolically costly. Unlike Kahneman's two-speed "thinking fast" and "thinking slow," this is a multi-geared system. Unlike standard economic models and Kahneman's "thinking slow," no mathematical calculations using combinations of outcomes and probabilities occurs.

Narrative economics might enlighten behavioral economics, which deems heuristics sources of lamentable bias. Over recent years, researchers have identified so many heuristics that some disparage of a "bias zoo" – a menagerie of purported biases that may reflect publication bias problems rather than actual human behavior. Economists disparaging human irrationality often emulate grammar mavens disparaging of dangling participles and split infinitives. Taking a gentler but still paternalistic stance, Thaler and Sunstein (2009) propose that regulations be crafted to trigger people's heuristics to "nudge" them towards behaving as economic models of rationality would have them behave. Economists may be prone to a degree of arrogance in casting their highly stylized models as rational. For example, expert economists actually have a regrettable history of pressing aid recipients to behave as their models required and watching profoundly non-adaptive outcomes materialize (Easterly 2014).

A humbler behavioral economics might explore the dynamics of heuristics – that is, whence come new heuristics, how (or how well) does economic selection cull maladaptive heuristics and reinforce adaptive ones?

This recasts Bhidé's (2025) central question: whence come entrepreneurial ideas? Lo (2017) and Shiller (2020) both stress how narratives spread from mind to mind. Lo memorably describes this as economics "at the speed of thought." Shiller (2020) describes the spread of successful narratives as obeying the same logistic mathematics that describes the spread of innovations, though he stresses its similarity to the logistic spread of diseases. Thus, some narratives lack traction and are stillborn, while others are attractive and spread exponentially for a time before leveling off once everyone open to the new narrative has embraced it.

Lo (2017) and Shiller (2020) agree that a widely spread narrative can alter reality. But Shiller's analogy to the logistic spread of diseases highlights how "successful" narratives can render their human hosts unsuccessful. Like diseases, harmful narratives can successfully spread logistically as long as their rates of contagion exceed the rates at which they bring destruction down upon their hosts. Thus, Shiller sees destructive ideologies spreading despite doing harm to those who take them up and leaving the world worse off. Analogies with the evolution of pathogens may be apt. Diseases that kill too many of their hosts too fast die out, and so might economic narratives. Shiller (2020) develops this formally using equations from epidemiology. Successful diseases eventually mutate and come to symbiotically boost the fitness of their hosts. So might economic narratives.

New narratives stand out as especially likely to spread when radical uncertainty becomes more important. Keynes (1936, 114) argues: "Knowing that our own individual judgment is worthless, we endeavour to fall back on the judgement of the rest of the world which is perhaps better informed." When least confident in their own judgment, humans are most prone to look for narratives aligned with the actions of others they deem less perplexed.

Keynes (1936), Lo (2017) and Shiller (2020) argue that the spread of an economic narrative can alter the terms on which individuals interact and thus create its own space in the repertoire of successful narratives.[2] For example, after a major hurricane leaves a city in ruins, two different narratives evoke two different subsequent histories. If a narrative of doom – "the city will never recover" – spreads and becomes dominant, citizens who reject this narrative and invest in rebuilding their homes and

businesses lose heavily. Rebuilding is unwise if no one else rebuilds. In contrast, if a narrative of hope – "the city will rise again" – spreads and becomes dominant, citizens who rebuild will be surrounded and supported by the economic activity of others' rebuilt homes and businesses. Rebuilding is thus only wise if everyone else rebuilds too. Which narrative catches on affects common patterns of behavior, which affect the effect of the narrative on the economic success of individual humans adhering to it.

7. Narratives for Prosperity

This process may be directly relevant to entrepreneurship, innovation, and sustained high and rising living standards. A rapidly spreading narrative about a new technology's promise can, if the technology has network externalities, change reality to make the technology economically viable. A telephone is of little value if yours is the only one, but becomes very valuable if everyone else has one too. A rapidly spreading narrative that spurs people to "act" and obtain a telephone creates a self-sustaining high-level equilibrium where everyone has telephones. Absent that narrative, everyone realizes having a telephone is unwise because there is no-one to ring up and telephones remain a curiosity for the wealthy. Many important new technologies have network externalities, and so can be made self-sustaining by narratives. Canals, railroads, telegraphs, electric power grids, cell phones, and the internet are all examples.

Contagious narratives may well undergird all manner of innovation. Financial history exhibits repeated mania, panic, and crash cycles (Kindleberger 1977). These Kindleberger cycles are of irregular spacing and duration, but follow a standard script. Each begins with a displacement – usually a major new technology or market with very high returns for early movers. This creates a narrative of the form "invest in the big new thing and you will surely get rich." As the narrative spreads, capital floods into the new technology and related areas, driving up the share prices of firms in those sectors. Hence as capital inflow pushes up stocks, attracting yet more capital and pushing stocks further up, increasingly implausible narratives spread. These include "new age" narratives that explain ever rising stock returns as evidence of a new economy to which the old laws of economics are irrelevant. At some point, the bubble pops and stock prices collapse. A negative narrative spreads fear, causing investors to sell their shares. The stock market collapses and, if

banks and near banks had lent into the bubble, the financial system freezes. After a time things sort themselves out and the economy grows slowly until the next big new thing arrives and another Kindleberger cycle begins.

Kindleberger cycles are generally cast as economically destructive lapses of rationality; however, this may miss their virtues. Under normal circumstances, firms and investors chronically socially underinvest in innovation because the social returns to innovation are some fourfold greater than the private returns to the innovating firm (Jones and Summers 2021). This is because of the combinatorial spillovers discussed above: firms build new products and processes using innovations developed by other firms, so the benefit of a typical innovation to the economy is much greater than the benefit of the same innovation to the firm that creates and develops it, and to that firm's investors. That humans are highly susceptible to narratives about the innovations that give rise to Kindleberger cycles at least partly counteracts chronic social underinvestment in innovation (Morck 2022).

Kindleberger cycles are prominent in the financial histories of all major high-income economies; legal and regulatory reforms to suppress Kindleberger cycles are routinely and promptly discarded in all major high-income economies. This may be because Kindleberger cycles make economies prosper by increasing the overall pace of innovation in them and because economies that successfully supress Kindleberger cycles cease being prosperous. Economic selection thus disfavors such reforms (Morck 2022).

8. Narratives of Ritual Dissent

Narratives can harden into routines, and much of evolutionary economics describes selection for better routines. Bhidé (2025) describes this well. However, links between routines and innovation may further explain the importance of certain institutions to economic prosperity. The importance of some institutions follows from the discussion above. For example, larger and more active stock markets provide more abundant risk tolerant capital to innovators than do other forms of financing – and also might allow larger and more productive Kindleberger cycles.

Other institutional correlates of prosperity might be explained by narratives.[3] For example, innovation-powered prosperity is associated with

competitive democracy, the common law, and refereed research publications. Lawmaking in democracies might be more exposed to lobbying by businesses and investors, which might be shaped by narratives of innovation. Common law courts rely on precedents and vague statutes, seemingly less useful than the expert crafted and extensive codes that civil code courts rely on. However, a common law court procedure features a judge and jury attending to the arguments of rival attorneys; whereas civil code court procedure has a magistrate calling witnesses, directing the police, and coming to a decision, the two sides' lawyers relegated to minor supporting roles. Civil code courts feature a single authority, under whom the heuristic "obey authority" can prevail. In contrast, common law court procedure institutionalizes conflict between two rival authorities, the two sides' attorneys, preventing the "obey authority" heuristic from converging on a decision, and forcing the judge and jury to activate Kahneman's "thinking slow" or to more deeply trawl through their narrative memories. More thoughtful decision might then ensue.

Academic research likewise institutionalizes dissent by subjecting research presentations to discussants and research publications to peer review, both designed to elicit conflicting expert opinions and activate "thinking slow" or deeper memory searches. Corporate governance reforms that institutionalize constructive criticism by creating rival authorities to the CEO – led independent directors, independent chairs, and the like – appear more effective as the amount of power vested in such rival authorities rises (Fogel et al. 2021).

9. Narrative Intelligence and Entrepreneurial Success

Mainstream economics has long accepted that innovation, or technological progress, explains most economic growth, that the most innovative new technologies enter the economy in new firms run by entrepreneurial founders. Because the owners, managers and employees of large established firms are unenthusiastic about their own firms' destruction, creative entrepreneurs must generally found new firms to develop their innovations. Consequently, the pace of productivity growth depends the pace of creative destruction – that is, the rate at which new creative large firms destroy, partially or completely (Fogel et al. 2008).

This in turn requires uncertainty-tolerant, and patient, forms of financing for start-up firms. Economic history casts this part to the financial

sector, and especially to stock markets (Rosenberg and Birdzel 1987; King and Levine 1993), with private equity perhaps a less apt understudy (Magnuson 2017). As highly creative entrepreneurs often lack great family wealth, they need angel investors, venture capital funds, and equity markets. These creative entrepreneurs, not always the actual originators of the underlying ideas, forge ways to make the ideas economically valuable new technologies (Schumpeter 1934, 81). Because new technologies can disrupt the status quo, creative entrepreneurs can be unpopular in establishment circles.

Schumpeter (1911) posits that a small fraction of humans possesses an intangible quality of entrepreneurial creativity. Creative entrepreneurs are not exceptionally strongly motivated, or able, to maximize profits (Swedberg 2021). Rather, Schumpeter sees them energised by a "will to conquer," and the "joy of creating, of getting things done" (Schumpeter 1934, 93). Schumpeter (1947, 151) argues that creative entrepreneurs, unlike all other economic actors, can imagine "the doing of new things or the doing of things that are already being done in a new way" and (Schumpeter 1934, 68) conceive of "new combinations [that] draw the necessary means of production from some old combinations."

Creative entrepreneurs continually replace existing production technologies with new higher productivity production technologies, either product or process innovations or both combined. A substantial literature explores the plausible motives, characteristics, and biographies of important entrepreneurs. Bhidé (2025) covers the most important aspects of this literature exceptionally well. Although, the determinants of entrepreneurial aptitude, ability, competence, and potential remain debated, this accumulating evidence points to what we might call "narrative intelligence" as critical.

Narrative economics suggests that the relevant forms of decision-making – entrepreneurs' decisions to develop innovations, skilled employees' decisions to work for new entrepreneurial firms, consumers' decisions to buy new products – can be understood in terms of the formation and selective spread of narratives. Entrepreneurs thus need new narratives to proliferate new decisions. Successful entrepreneurs might thus be adept at originating the sorts of highly transmissible new narratives that can alter other people's decision-making. Alternatively, fortuitous circumstances might supply appropriate new narratives for time to time, abruptly permitting product or process innovations that long gathered dust. Either way, the origination and transmission of narratives is central.

10. Narratives of Innovation

Mokyr (2016) defines "cultural entrepreneurs" as architects of new narratives. Schumpeter sees business entrepreneurs as recombiners of existing building blocks into new or lower cost processes for making more or more valuable products. Successful cultural entrepreneurship might likewise be the successful recombination of familiar memes into new contagious narratives. Literary theorists debate the constraints of narrative structures in fiction – for example Booker (2004) famously argues that all the stories with which humans regale each other fall into seven basic plot arcs. This classification is not universally accepted, but if there are psychological patterns common to successful narratives in literature, might they equally well apply in economics? Or, need economists search for patterns unique to the narratives of economic innovation?

Cultural narratives that reshape reality are said to create social constructs. These can be destructive – as when narratives of racial or gender superiority construct racist or sexist limited access political structures – or constructive – as when narratives of liberty, equality and fraternity support construct open access political systems (North et al. 2009). Scientific discovery has also been modelled as the creation and spread of attractive narratives (Plotkin 1993; Dennet 1995). Unlike cultural narratives in literature and politics, narratives in science can fall away if experimentally refuted – though this can take time. Quantum mechanics, relativity, and ulcer-causing bacteria all took decades to displace their well-falsified predecessor theories. In economics, Samuelson (1976, 845) counted intellectual time in generations – older generations of economists invested in old theories that were subsequently replaced by new generations with no legacy intellectual capital to protect – so that economics "advances funeral by funeral."

A few centuries ago technological progress began accelerating in a few Western economies, and then across an expanding stretch of global geography. Refugees from the fall of Constantinople in 1453 had replanted Classical Greek and Roman narratives amenable to science into Northern Italy, whence they spread to the Low Countries, England, and the countries now counted as the First World. The rising and broadening elevation in living standards that created today's First World economies is historically unique. Classical narratives had no such consequence in Classical antiquity.

What then is unique in the histories of First World economies? Politically current narratives attributing their prosperity to slavery and colonial land grabs neglect the failure of slavery and imperial land grabs, both ubiquitous throughout world history, to create broad middle class prosperity in the Aztec, Byzantine, and Carthaginian empires. How did ancient narratives amenable to scientific inquiry engender this rapid and sustained technological progress as never before? Obviously, something historically unique must have been in the air in recent centuries.

The unique economic phenomena requiring explanation are: Modern prosperity arose far less from using more labor, capital, and other inputs than from technological progress – the repeated substitution of new technologies that produce more or more valuable outputs from fewer or less costly inputs than did old technologies (Solow 1957). Ongoing technological progress is a process of creative destruction – each generation of creative entrepreneurs builds new business empires upon new more productive technologies that repeatedly, partially or completely, prior generations of entrepreneurs' business empires built upon prior rounds of technological progress (Schumpeter 1911). Accepting that narratives shape human thinking (Shiller 2020; Bhidé 2025), the question becomes: What new narratives in the air in recent centuries might explain modernity's historical uniqueness and how did they come to prevail?[4]

Self-reinforcing narratives of wealth through investment in new business models arose in Amsterdam as the profits attainable from joint stock companies doing oceanic trade came into focus. Refugees from Roman Catholic religious zealotry brought the mathematics of navigation, and the idea of trade with distant economies, to the tolerant Dutch Republic, whose burghers recombined them yet again. The navigation schools of Amsterdam trained the world's best sailors in trigonometry and logarithms, mathematical knowledge largely unavailable elsewhere. Long-distance maritime trading ventures using advanced navigational techniques based upon new mathematical knowledge were the high-tech firms of the age. The first high-tech stock mania emerged on the first modern stock exchange as shares in the Dutch East India Company and other joint stock companies soared in the early 17th century. Shiller (2020) documents the spread of New Age narratives that coordinate the decisions of investors and entrepreneurs. These spread to other new things – notably speculation in the rare and prized tulip. The market crashed in 1637 and tulips never recovered, but stocks in maritime trading recovered and prosperity returned.

The 1688 Glorious Revolution brought a Dutch elite to power in England and Dutch ways of doing business to London. The latter proved profitable and spawned a new round of New Age narratives. Another high technology bubble ensued as all manner of joint stock companies formed to undertake new business opportunities, issued shares, and expanded. Many fraudulent companies, especially the South Seas Company, fleeced investors as stocks rose, but steam-powered mills, canals, and trading ventures also found abundant financing. The bubble collapsed in 1620 and Britain's parliament passed new laws restricting the formation of joint stock companies to prevent such a thing from ever happening again. These restrictions fell away very slowly. A parliamentary charter was needed for each new joint stock company, but these became more routine over time. In the 19th century, when Britain's Industrial Revolution went into high gear, the restrictions fell away entirely. Financial mania panic and crash cycles resumed in the late 18th century and recurred every few decades throughout the 19th century around each of a succession of hot new technologies, each sustained by the spread of a new New Age narrative.

The New Age narratives that support recurring mania, panic, and crash Kindleberger cycles look like problems to mainstream economics, including mainstream behavioral economics. However, absent these cycles, baseline investment in innovation would be much lower and the pace of technological progress would be much slower. Floods of investment into big new ideas also characterize science – as when narratives casting research in string theory or messenger RNA as the new path to grants and fame. New Age narratives can energize people to invest inordinate time and effort, as well as inordinate money, in bold new ideas. Individuals may end up without fame or portfolio wealth, but may still be better off than they would have been in a world without technological and intellectual progress.

11. Innovation of Narratives

A faster pace of technological progress would seem to require a faster pace of origination and spread of supporting narratives. New Age narratives are implicated, and further research may show them to be necessary conditions. The creation of New Age narratives obviously needs imagination – they describe new products and processes that radically improve life. Yet successful narrative origination obviously also requires a kind of

empathy. Adam Smith (1776, 27) sees prosperity arising from producers competing for profits: "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest." However, Smith (1752) argues that humans also rely on "fellow feeling" – the ability to sense of what makes others happy or unhappy. The two positions are not contradictory. The successful baker empathizes with potential customers enough to know how much they want various sorts of breads, cakes, and pies. The successful baker produces what people want and sells it at prices people are willing to pay. The baker who follows his artistic muse without regard to fellow feeling courts penury.

The ethical implications that follow from Smith's insight are profound – greater business success comes not from more single-minded profit seeking, but from more intense fellow feeling for potential customers, the greater success of which increases profits.Portraying entrepreneurs as empathic raises hackles, but empathy is not niceness. Entrepreneurs need not be nice to understand people's wants and needs (Schmidt et al. 2025).

Successful narrative creation likewise requires fellow feeling. To spread rapidly, a narrative must give people something they want on terms they deem reasonable. This part is easy, as the proliferation of internet memes demonstrates. Narratives drafting all manner of implausible conspiracies, ethnic prejudices, and political plots to explain why some people are less successful than others are satisfy both criteria for the former and thus spread. A cultural entrepreneur's fellow feeling might echo the warmth contemplating these narratives gives their adherents.

However, successful narrative creation requires a deeper use of fellow feeling than this. To survive, economic narratives must "work" by describing or bringing about the reality they portray. Lo (2107) describes narratives whose scripts and outcomes are more soundly connected as more intelligent. Smarter narratives are narratives that work more reliably. Intelligence is not always beneficial, for a conspiracy theory narrative that both explains, yet also undermines, one's economic position is nevertheless intelligent by this definition.

Successful entrepreneurial narratives both work and increase productivity. They must provide a sufficiently compelling script that, when followed by the individual and by enough other individuals, sustains itself for a time. In the case of New Age narratives built around new technologies, long enough for the new technology to be

deployed. A narrative that causes a speculative bubble that destroys its adherents' portfolios when it pops but leaves its adherents living at a higher productivity level can be deemed more intelligent to the extent that the latter outweighs the former effect.

12. More than a Science

Narrative economics also accords with Schumpeter's (1942, 8) view that businesspeople are "in a situation that is sure to change presently … standing on ground that is crumbling beneath their feet." Unlike mainstream economic models, in which the future obeys known probability distributions across quantifiable outcomes, or quantifiable probability distributions across sets of quantifiable probabilities and outcomes, a progression of narratives repeatedly recasts the scripts and outcomes set before real decision-makers. The innovations that power progress are previously unimagined. Typewriter manufacturers in the 1970s did not scale back their investment in proportion to estimated probabilities of the exponential growth of word processing made possible by exponentially falling semiconductor unit costs. Nor did most makers of word processing software microcomputers, or microchips, at least until it was all already well along. Throughout modern history, the most economically important innovations initially arose from outside the states of the world imaginable in the past.

If ideas are indeed narratives, work on new idea generation is relevant. One approach derives exponential economy growth from new ideas modeled as recombinations of existing ideas (Weuisman 1998). Jones (2023) models innovators creating ever more valuable new ideas by posits recombining draws from the upper tails of the value distributions of existing ideas. Buera and Lucas (2018) calibrate a dynamic stochastic rational expectations model of idea-laden rational individuals recombining their ideas as they move between firms and firms reorganize to explain productivity growth. This approach, though elegant, falls to Bhide's criticism that people steadfastly refuse to play the rational actors rolls into which economists cast them.

Others approaches are therefore of interest. Recombinant economic growth can arise from economic selection across new narratives, formed as recombinations of existing narratives, for narratives describing higher productivity technologies (Fleming 2001; Fleming and Sorenson 2001). This accords with Lo's (2017) description of economic growth as a process of adaptive expectations - economic selection favoring the

spread of ideas that are more "fit" in terms of delivering higher productivity under prevailing conditions and the culling of ideas that are less "fit" in that sense.

Such deeply ideational accounts evoke Shackle's (1965) *kaleidostatic* decision-making: people must make choices under conditions that, like a kaleidoscope, "can change as swiftly, as completely, and on as slight a provocation as the loose, ephemeral mosaic of the kaleidoscope." Whatever has just come into view can dissolve itself at "[a] twist of the hand, a piece of 'news,' can shatter one picture and replace it with a different one" (Shackle 1965, 48). Because of this, Shackle concludes: "economics is not a science, and we ought not to call it a science."

Science was built upon economics, in that modern economies fund science at a scale never before possible. But, despite the earnest wishes of many economists, economics likely cannot be built along the lines of the sciences. The deepest problems in the sciences are about quantifiable probabilities and outcomes, but the deepest problems in economics are about the expansion of human prosperity – the ongoing replacement of old technologies by more productive newly created technologies that come from outside the space of previously conceived probabilities and outcomes. Economics must explain how humans pull this off, despite or more likely because of doing their thinking in narratives and not equations. Scientific progress must work this way too, and so falls within economics. In these ways, economics, while not a science, turns out to be more than a science.

NOTES

1. For statistical support for these claims, see Deaton (2014).
2. In this, Keynes (1937) qualifies his earlier position (Keynes 1921, 4) that "a proposition is not probable because we think it so."
3. For detailed cites and discussion of issues in this paragraph, see Fogel et al. (2022).
4. The historical discussion in the next few paragraphs is discussed at greater length in Morck (2022).

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