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POLICY BRIEF

Innovation Unbound

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Inventors and entrepreneurs are key drivers of innovations that result in improvement in human welfare. Peter Thiel and Tyler Cowen worry that in recent decades, except in information technology, innovation has been sparse. Thiel suggests the sparseness will end when entrepreneurs and potential entrepreneurs show more courage.[1] Cowen suggests that the sparseness will end when the stock of entrepreneurial opportunities is replenished (since at present all the low-hanging fruit has been picked).[2] Contra Cowen, I believe we do not need to wait for the low-hanging fruit to grow back; plenty of opportunities can be created by innovative entrepreneurs right now—if society lets them. And while I join Thiel in encouraging courage, I blame the sparsity not mainly on too little courage, but mainly on too much government regulation.

In my book *Openness to Creative Destruction: Sustaining Innovative Dynamism* (2019), I argue that the strongest case for a laissez-faire economy is that it allows innovation, and innovation results in huge human betterment.[3] Laissez-faire policies are embedded in a culture of tolerance that both encourages, and is encouraged by, an economy of innovative dynamism.

INTRODUCTION

Life has improved through innovations, which have occurred through the efforts of inventors and entrepreneurs. These innovations have made life longer and better, partly by providing more primary goods such as food, clothing, and shelter that allow people to choose from a very wide variety of life plans, and partly by especially enabling people to choose from the narrower, but still broad, set of life plans that, with a nod to Abraham Maslow, seek more comfortable, satisfying, creative, and fulfilling lives.[4]

Some argue that the innovations are inevitable. Kevin Kelly has gone so far as to suggest that Moore's Law would still be true even under communist dictators.[5] The dearth of innovation under Stalin, as he imprisoned and executed inventors, suggests otherwise. I argue, to the contrary, that innovation is driven by inventors and entrepreneurs and that invention and entrepreneurship are hard and scarce. Policies can be crafted to encourage entrepreneurs to bring society more innovations.

THE EPISTEMOLOGY OF INVENTION AND ENTREPRENEURSHIP

To learn how government regulation affects innovation, it is useful to drill deeper into how inventors and entrepreneurs think and act in the process of innovation.

A great many breakthrough inventors and innovative entrepreneurs have modest academic credentials.[6] They often do not know, or at least do not highly revere, currently dominant theories. This is no coincidence. Fortunately, Guglielmo Marconi either did not know or did not much revere the physics of his day, which said that radio waves broadcast from Britain would go straight into outer space rather than be received in Canada. (When he succeeded in receiving the waves in Canada, physicists scrambled to patch their theory.)[7]

The highly credentialed are at a disadvantage partly because their knowledge of the dominant theories keeps them from trying to do what the dominant theories say cannot be done. But a more fundamental disadvantage of credentials is that the time and thought processes used to achieve the credentials crowd out the time and thought processes needed to achieve innovations. Memorizing current theories is a different kind of thought process from brainstorming new theories or technologies. When James Watson and Francis Crick were working on the structure of DNA, they arranged to have lunch with DNA expert Erwin Chargaff. Chargaff left the lunch feeling contempt for Crick, because Crick not only had yet to earn his PhD, he also could not even remember the names of the four bases that make up DNA.[8] But it was Crick (with Watson), and not Chargaff, who is now celebrated for discovering the structure of DNA.

Policy implication for regulators: if credentials can be a disadvantage, regulators should use a light hand in requiring would-be innovators to be highly credentialed.

A second key finding on the epistemology of entrepreneurship is that, while breakthrough inventors and innovative entrepreneurs have less formal credentialed knowledge, they tend to have more informal, hard-to-articulate knowledge. New ideas do not emerge fully formed, like Athena from the head of Zeus. They emerge fragile and inchoate. The process by which the fragile and inchoate is sometimes transformed into the strong and clear needs much further study, but some features of the process are already known: the innovator often has tacit knowledge acquired from alertness to unique serendipitous experiences. Sometimes the innovator forms what Steven John-

son calls a "slow hunch" that needs to be mulled over and articulated over an extended time.[9] Often the innovator needs to engage in nimble trial-and-error adjustments and experiments to strengthen and clarify the idea.

As Peter Thiel reminds us, at the early stages the innovator will often be alone, seeing what others do not see.[10] The easy path is to shrug and forget. The hard path is to remember and think. The hard path requires courage, perseverance, and hard work. The details of the hard path cannot be mapped out in advance. In business, managers calculate the efficient path along a well-mapped, well-marked highway toward a known goal. Entrepreneurs, machetes in hand, hack their way through unexpected obstacles toward a faintly seen goal.[11]

This second key finding has a profound implication for the popular "precautionary principle" for regulating innovations.[12] The principle says that an innovation should be banned unless it can be proven in advance that no harm will result from it. But the path of the innovator cannot be known in advance. The greater the innovation, the less the path can be known.

Policy implication for regulators: if the path of innovation cannot be known in advance, the precautionary principle should be rejected.

The harmful effects of regulation on innovation can be illustrated in three important domains: finance, the labor market, and healthcare.

FINANCIAL REGULATIONS

Financial innovations were not the primary causes of either the Great Depression or the economic crisis of 2008. On the contrary, government actions, instead of protecting against the downturns, were largely responsible for them. The Great Depression was caused by Federal Reserve policies and was lengthened and deepened by tariffs, regulations, and taxes that discouraged investment and job creation by entrepreneurs.[13] The crisis of 2008 was caused by the federal government mandating quasi-governmental agencies to create large pools of unsound mortgages, which were then approved by regulators to be used as the basis of opaque derivatives.[14]

Financial regulations often are not effective at protecting consumers from fraud and often slow down innovations that would benefit consumers. Securities and Exchange Commission (SEC) regulators slowed down Georges Doriot's creation of American Research and Development, which is now celebrated as the first successful venture capital firm.[15] More recently, at the behest of incumbent banks, financial regulators blocked Walmart from providing limited, but inexpensive, banking services to poor and blue-collar customers who cannot afford the services of incumbent providers.[16]

If financial regulations greatly enhanced fraud detection, then less innovation might be a regrettable, but necessary, tradeoff. But the already-substantial financial regulations have not been very

effective at identifying fraud. Of those cases of fraud that are ever eventually identified, only 7 percent are identified by the SEC.[17]

Policy implication for regulators: if financial regulations slow innovations beneficial to consumers and do not protect much against fraud, regulators should use a light hand in imposing financial regulations.

LABOR MARKET REGULATIONS

To achieve breakthrough innovations, and sometimes for the survival of their startups, innovative entrepreneurs need to be able to fire employees. Unregulated (flexible) labor markets allow innovative entrepreneurs to make nimble adjustments based on their tacit knowledge or trial-and-error experiments concerning which employees will be productive and innovative under which incentives and work settings. For instance, Steve Jobs's adjustments at Apple and Pixar are given some credit for those firms' eventual successful innovations.[18]

But do these innovations come at too high a price for workers? Workers do well when the unregulated labor markets that encourage entrepreneurial innovation are also robustly redundant job markets.[19] In robustly redundant job markets, workers can find good or better new jobs when they lose an old job. Robustly redundant job markets have more job churn, but this can benefit workers when it results in a better match between worker and job.

In a system of innovative dynamism, young, fast-growing entrepreneurial startups, sometimes called "gazelles," create more jobs than they destroy, and the new jobs tend to be better jobs.[20] So the unregulated labor markets that increase churn result in more and better jobs and in better matches between workers and jobs.

An unregulated labor market benefits workers not only by sustaining a robustly redundant job market; it also benefits workers by allowing more opportunities for them to leave the job market to become free-agent entrepreneurs. By becoming a free-agent entrepreneur, workers can more easily achieve the sense of control that comes from being their own boss.

While many labor regulations are aimed (unwisely, I argue) at preserving jobs, others are aimed at mandating work-life balance. Some entrepreneurial firms, especially in Silicon Valley, are accused of harming their founders and workers by making the work too intense. In *Openness* I argue that work-life balance is a reasonable choice, but that intensity is also a reasonable choice.[21] Work-life balance allows quality time with family and friends. Intensity allows the "flow" experience of immersing oneself in a challenging but doable project that matters.

Many breakthrough innovations have been implemented by intense teams. Though team members may complain about the long hours, pizza dinners, and weekends in the office, many of them

would choose to do it again. Those who would not choose to do it again (or even to do it a first time) will have no trouble finding many managers and entrepreneurs who themselves seek work-life balance and so will build work-life balance into the jobs of their workers. But the few intense entrepreneurs should be allowed to pursue their breakthrough innovations, and workers should be allowed to sign up to be part of those innovative entrepreneurs' intense teams.

Policy implication for regulators: if flexible labor markets allow entrepreneurs to bring society breakthrough innovations and to create more and better jobs, regulators should keep labor markets flexible by using a light hand in imposing labor market regulations.

HEALTHCARE REGULATIONS

In the past several decades, advances in information technology have been larger and faster than advances in healthcare and have been achieved at lower cost. In *Openness*, I suggest that the reason is not that information technology is more important than healthcare or that information technology has more low-hanging fruit than healthcare. Rather, the reason is that information technology has been left free to innovate, while healthcare has been bound by regulations.[22]

Realizing the intrinsic importance of healthcare, some successful Silicon Valley entrepreneurs have considered applying their talents and resources to medical entrepreneurship. When Google cofounder Sergey Brin was asked if he might make the leap, he responded, "It's just a painful business to be in," and elaborated later that "the regulatory burden in the U.S. is so high that I think it would dissuade a lot of entrepreneurs."[23] Eric Schmidt, when he was executive chairman of Google, understood that: "Regulation prohibits real innovation, because the regulation essentially defines a path to follow."[24]

The same epistemology of entrepreneurship that underlies innovation in general also underlies medical innovation. Advances against cancer have come through alertness to serendipitous experiences, the pursuit of slow hunches, and nimble trial-and-error experiments.

Sidney Farber now has a hospital named after him, but he was pilloried by colleagues when he plausibly gave his childhood leukemia patients the folic acid that sped their decline. He then nimbly and plausibly gave his next patients an antagonist to folic acid. These patients went into remission—not cured but providing proof that chemotherapy could work.[25]

Fast-forward to Emil Freireich, who was pilloried by his colleagues and threatened with firing by his superiors for nimbly adjusting his side-effect-laden chemo cocktail. One cynical young colleague called Freireich's intense team the "Society of Jabbering Idiots" when they met each week to argue about what to try next. But something important emerged from the intensity. Some of Freireich's young leukemia patients experienced not just remissions, but cures.[26]

Vince DeVita was young and cynical too. Amused at his friend's label for Freireich's team, he thought he was attending the meetings for entertainment. But at some point, he realized that he too wanted to join the jabbering idiots, because the jabbering idiots were curing cancer. DeVita soon went on to form his own team, using nimble trial-and-error experimentation to achieve cures for Hodgkin's lymphoma.

He went on to achieve prestigious credentials, including director of the National Cancer Institute (NCI). After he was worn down by the governmental decision processes of the NCI, he left for distinguished positions at the Memorial Sloan Kettering Cancer Center and at the Yale Cancer Center. So DeVita has credibility when in *The Death of Cancer* he blasts the FDA's mandatory protocols for constraining the kind of nimble trial-and-error experiments that allowed him—and, earlier, Freireich—to achieve cancer cures.[27]

The problem is not unique to chemotherapy. One of the currently most promising approaches to curing cancer is immunotherapy, pioneered in part by Steven Rosenberg. In an early autobiography, Rosenberg describes how demoralized he became as FDA panels slowed and blocked his attempts to nimbly and boldly innovate during the early development of immunotherapy.[28]

Policy implication for regulators: if nimble trial-and-error experiments allow medical entrepreneurs to bring society breakthrough cures for cancer and other diseases, the FDA should not mandate protocols that slow or ban nimble trial-and-error experiments.

WHY REGULATIONS PERSIST

Regulations persist because special interest groups benefit from the regulations, because society underestimates how much regulations harm innovation, and because society overestimates how much regulations protect consumers and workers.

Over at least the past 45 years, with only a couple of brief pauses, the number and complexity of regulations have grown.[29] These numerous and complex regulations favor the special interests of large incumbent firms that have staff specializing in understanding and influencing regulations. Large incumbent firms, having mastered the current technologies, do not mind that regulations slow the innovations that will make the current technologies obsolete.

A more subtle reason regulations persist is that the costs and benefits of regulations are often poorly understood, even by innovative entrepreneurs. In *Openness*, I recount the story of my childhood optometrist Robert Vodnoy, who was an innovative entrepreneur in eye care. He was opposed to regulations of eye care because he knew they slowed innovation and did not protect consumers much. But outside of eye care he favored regulations, not seeing how they slowed innovation. People opposing regulations in areas they understand and favoring regulations in areas they do not understand is what I call the "Vodnoy Paradox."[30]

Some will object that a world of greater innovations, allowed by fewer regulations, will be less safe. They should realize that before innovations such as electric lighting, the world was a more dangerous place, and that more innovations can make the world still safer. But even those who grant that most innovations have made the world safer may still worry that having fewer regulations would leave society no recourse against an irresponsible innovator. John Chisholm answers that "organic regulations" would give people recourse.[31] For instance, the common law has developed standards of conscientious reasonable care. When the standards are violated, those harmed can sue for damages. Most innovators are motivated by a desire to make the world a better place, and so do not need the common law to help them to avoid harming others. But for the few who need a nudge, the possibility of being sued for damages provides an added incentive.

For many sorts of innovations, early adopters voluntarily "sign up." They may enjoy the adventure or they may feel satisfaction that they are doing their part to improve the world. They are Amar Bhidé's "venturesome consumers."[32] When the early installation of Edison's electric lighting in the Vanderbilt home resulted in a fire, Mrs. Vanderbilt ordered that the electric wiring be torn out, and the home returned to gas lighting. Mrs. Vanderbilt did not sign up to be venturesome.

When the early installation of Edison's electric lighting in J. P. Morgan's home library also resulted in a fire, Morgan demanded an explanation from an Edison employee named Edward Johnson. Johnson feared Morgan's anger and expected Morgan would have the electric wiring torn out. He told Morgan what they had learned and how they would do a better job in their next attempt. Morgan looked at Johnson, said, "All right; see that you do," and left the room.[33] J. P. Morgan signed up to be venturesome.

Those who now benefit from safe, cheap electric light owe a debt to the Thomas Edisons of the world for their breakthrough inventions and their innovative entrepreneurship. They also owe a debt to the J. P. Morgans of the world for their venturesome consumption. And they owe a debt to the voters and the civil servants whose light-handed regulatory forbearance in the golden age of innovative dynamism allowed the breakthrough inventors, the innovative entrepreneurs, and the venturesome consumers to illuminate our world.

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Arthur M. Diamond Jr. earned graduate degrees in philosophy and in economics from the University of Chicago, where he also was awarded a postdoctoral fellowship with economics Nobel laureate Gary Becker. He served on the faculty of the department of economics at the Ohio State University and is currently professor of economics at the University of Nebraska Omaha. Diamond has published many journal articles on labor economics, the economics of technology, and the economics of entrepreneurship. His *Openness to Creative Destruction: Sustaining Innovative Dynamism* was published in June 2019 by Oxford University Press.

NOTES

1. Peter Thiel and Blake Masters, *Zero to One: Notes on Startups, or How to Build the Future* (New York: Crown Business, 2014), 5.
2. Tyler Cowen, *The Great Stagnation: How America Ate All the Low-Hanging Fruit of Modern History, Got Sick, and Will (Eventually) Feel Better* (New York: Dutton Adult, 2011).
3. Arthur M. Diamond Jr. *Openness to Creative Destruction: Sustaining Innovative Dynamism* (New York: Oxford University Press, 2019); Deirdre N. McCloskey, *Bourgeois Equality: How Ideas, Not Capital, Transformed the World* (Chicago: University of Chicago Press, 2016), 108–9, 132–33, 583.
4. Abraham H. Maslow, *Motivation and Personality* (New York: Harper Brothers, 1954).
5. Pagan Kennedy cites (and later refutes) Kevin Kelly's claim in her book: Pagan Kennedy, *Inventology: How We Dream up Things That Change the World* (New York: Houghton Mifflin Harcourt, 2016), 122, 195–96. Kelly's general defense of inevitablism, in a slightly more restrained form than that quoted by Pagan, also can be found in Kevin Kelly, *What Technology Wants* (New York: Viking Adult, 2010).
6. The modest academic credentials of many innovators were highlighted in William J. Baumol, "Education for Innovation: Entrepreneurial Breakthroughs Versus Corporate Incremental Improvements," in *Innovation Policy and the Economy*, ed. Adam B. Jaffe, Josh Lerner, and Scott Stern (Cambridge, MA: MIT Press, 2005), 33–56.
7. Diamond, *Openness to Creative Destruction*, 24, 26.
8. Gary Klein, *Seeing What Others Don't: The Remarkable Ways We Gain Insights* (Philadelphia: PublicAffairs, 2013), 134–35.
9. Steven Johnson, *Where Good Ideas Come From: The Natural History of Innovation* (New York: Riverhead Books, 2010), 77–78.
10. Thiel and Masters, *Zero to One*, 5.
11. The machete analogy is my embellishment of the idea that "carrying out a new plan and acting according to a customary one are things as different as making a road and walking along it." See Joseph A. Schumpeter, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, 2nd German ed., trans. Redvers Opie (London: Oxford University Press, 1961), 85.
12. The meaning and implications of the precautionary principle are well discussed in Cass R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge, UK: Cambridge University Press, 2005) and in Adam Thierer, *Permissionless Innovation: The Continuing Case for Comprehensive Technological Freedom*, rev. and expanded ed. (Arlington, VA: Mercatus Center at George Mason University, 2016).
13. Diamond, *Openness to Creative Destruction*, 83.
14. Diamond, 83–84.

15. Spencer E. Ante, *Creative Capital: Georges Doriot and the Birth of Venture Capital* (Boston: Harvard Business School Press, 2008), 140, 184–86, 191–92.
16. Diamond, *Openness to Creative Destruction*, 173–74.
17. Diamond, 174.
18. Diamond, 174–75.
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20. Diamond, 79–81, 92–98.
21. Diamond, 100–102.
22. Diamond, 177.
23. Kevin J. Tracey, "Let Patients Decide How Much Risk They'll Take," *Wall Street Journal*, July 27, 2014.
24. L. Gordon Crovitz, "Google Speaks Truth to Power," *Wall Street Journal*, October 24, 2011.
25. Diamond, *Openness to Creative Destruction*, 186.
26. Diamond, 187.
27. Vincent T. DeVita and Elizabeth DeVita-Raeburn, *The Death of Cancer: After Fifty Years on the Front Lines of Medicine, a Pioneering Oncologist Reveals Why the War on Cancer Is Winnable--and How We Can Get There* (New York: Sarah Crichton Books, 2015), 8, 92, 254.
28. Steven A. Rosenberg and John M. Barry, *The Transformed Cell: Unlocking the Mysteries of Cancer* (New York: G. P. Putnam's Sons, 1992), 4, 275, 286–88, 303–6, 316, 325.
29. Patrick A. McLaughlin and Oliver Sherouse, "The Impact of Federal Regulation on the 50 States" (Arlington, VA: Mercatus Center at George Mason University, 2016), 4.
30. Diamond, *Openness to Creative Destruction*, 180.
31. John Chisholm, *Unleash Your Inner Company: Use Passion and Perseverance to Build Your Ideal Business* (Austin, TX: Greenleaf Book Group Press, 2015), 313–18.
32. Amar Bhidé, *The Venturesome Economy: How Innovation Sustains Prosperity in a More Connected World* (Princeton, NJ: Princeton University Press, 2008).
33. The Vanderbilt and J. P. Morgan electrification stories are told in Randall E. Stross, *The Wizard of Menlo Park: How Thomas Alva Edison Invented the Modern World* (New York: Crown Publishers, 2007), 129–32. See also Ernest Freeberg, *The Age of Edison: Electric Light and the Invention of Modern America* (New York: Penguin, 2013), 73–74.