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COMMERCIALIZATION AWARDS

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Some patent law scholars have proposed introducing new forms of patents to promote commercialization of inventions that would not otherwise be commercialized, or at least not within a reasonable period of time. In this Article I suggest that so-called commercialization patents are unnecessary because the United States already has a system for promoting commercialization of inventions that does not require creating unprecedented exclusive rights: direct government financing. Drawing on statutes and administrative codes, I provide an in-depth account of the major commercialization financing options for inventors and entrepreneurs at both the federal and state levels. I then compare these incentives, called commercialization awards, to newly proposed commercialization patents. I show that, like commercialization patents, commercialization awards create strong incentives to commercialize inventions in the near future, and that award administrators employ a variety of strategies, such as strict investment matching requirements, to reduce the risk of wasting public money on projects that are not commercially viable. Given that non-patent commercialization incentives exist and may be as efficient or more efficient than commercialization patents, I argue that we do not need new forms of exclusive rights to promote commercialization and that introducing these rights would be unwise — especially in light of empirical uncertainty regarding whether patents promote innovation and the current anti-patent climate.

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INTRODUCTION

From the economic perspective, the role of patents is to promote innovation: invention followed by commercialization of inventions so that they can be used or consumed by those who need them.¹ In theory, by providing exclusive rights to make, use, and sell inventions for a limited period, patents create stronger incentives to invent and disclose inventions than would otherwise exist,² and increase the pace at which inventions enter the public domain.³ However, to the extent that patents promote commercialization, they do so, in Robert Merges’ words, “only indirectly, through the granting of patents on inventions.”⁴ Ted Sichelman puts it somewhat less favorably, stating that, in the dominant theoretical model, “patent law is primarily designed to induce invention; any protection it provides to commercialization is mostly an afterthought.”⁵

Some patent law scholars, including Sichelman, have suggested that as a result of patent law’s single-minded focus on invention patents are being commercially exploited at suboptimal levels.⁶ Mark Lemley disagrees, reasoning that the fact that many inventions have


² The primary utilitarian justifications for patents are the incentive-to-invent and incentive-to-disclose theories. See generally Rebecca Eisenberg, PATENTS AND THE PROGRESS OF SCIENCE: EXCLUSIVE RIGHTS AND EXPERIMENTAL USE, 56 U. CHI. L. REV. 1017, 1024-30 (1989).

³ For this view, see Michael Abramowicz & John Duffy, THE INDUCEMENT STANDARD OF PATENTABILITY, 120 Yale L.J. 1590, 1599 (noting that a “growing body of literature … views the patent system as attempting not so much to increase but to accelerate innovation.”) See also Tun-Jen Chiang, A COST-BENEFIT APPROACH TO PATENT OBVIOUSNESS, 82 S.J. L. REV. 39, 57-58 (2006) (“while virtually every invention would be created sooner or later even without a patent system, patents create incentives for additional research investment, leading to inventions being made sooner than they otherwise would be. The patent system creates no inventions, it accelerates them.”) See also Duffy, Rethinking the Prospect Theory of Patents, 71 U. CHI. L. REV. 439, 443-44, 464-75 (2004) (arguing that patents create a socially beneficial rivalry to place inventions in the public domain sooner than would otherwise occur.)

⁴ See Merges, Commercial Success and Patent Standards, supra, at 809 (“[T]he patent system rewards innovation only indirectly, through the granting of patents on inventions.”)

⁵ Ted Sichelman, Commercializing Patents, 62 STAN. L. REV. 341, 344 (2010). See also Edmund W. Kitch, THE NATURE AND FUNCTION OF THE PATENT SYSTEM, 20 J.L. & Econ. 265, 266 (1977) (arguing that “the conventional view of the patent system as a device that enables an inventor to capture the returns from his investment in the invention” is incomplete and providing a variety of justifications for viewing patents as “prospects” whose main role is facilitating commercialization efforts following invention); Scott Kieff, Property Rights and Property Rules for Commercializing Inventions, 85 MINN. LAW REVIEW, 697, 708-09, 735 (2001) (building on Kitch’s work, arguing that patents facilitate commercialization by protecting investments in invention and commercialization from free-riding and by facilitating private bargaining around patented inventions).

⁶ See, e.g., Sichelman, supra, at 341; Michael Abramowicz, The Danger of Underdeveloped Patent Prospects, 92 CORNELL L. REV. 1065, 1071-73 (2007) (observing that patents may expire prior to commercialization and proposing extending patent lifetimes to extend beyond investments in invention).
not been commercialized simply indicates that they lack commercial promise. But scholars like Sichelman counter that un-commercialized inventions do not necessarily lack long-term value. Rather, commercialization is hampered by the high cost and uncertainty involved in developing and marketing new products and services; the difficulty of raising capital for unproven ventures; and the chance that second movers will free ride off first movers’ market experiments. As a solution, they argue that Congress should create new forms of patents specifically targeted at promoting commercialization, including traditional invention patents for known technologies that were never successfully commercialized, or, in Sichelman’s rendition, a new form of “commercialization patent” that provides exclusive and affirmative rights to market “substantially novel” patented products that have not been commercialized within a few years of patenting, to last around five to eight years. Moreover, as Sichelman observes, at least sixty countries already offer similar forms of “second tier” patents, called “petty patents” – suggesting that introducing commercialization patents in the United States is not out of the question.

I do not disagree that market forces alone may not ensure timely commercialization of all promising inventions even in the presence of intellectual property (IP). But what participants on both sides of this debate ignore is that the United States already has a system for facilitating commercialization of emerging technology when private markets fail: direct government financing or so-called “commercialization awards.” Although commercialization awards implicate the primary risk stressed by Lemley – that the government will end up sponsoring lemons that private investors have rightly ignored – they do not generate the most oft-discussed costs associated with creating exclusive rights that protect more than invention: deadweight loss for consumers who cannot access innovations that they otherwise could, over-centralization of markets, and interference with future innovation. When seen in this context, commercialization patents are not “strikingly anti-

9 See Duffy & Abramowicz, supra, at 405.
10 Sichelman, supra, at 346. An earlier proposal for protecting innovation “directly, instead of indirectly,” is the “innovation warrant,” which could be obtained for anything, not just technology, so long as it is not available in the “ordinary course of trade.” The warrant would have a shorter period of exclusivity than an invention patent and would be calibrated based on the risk of investment. The warrant would be “irrevocable,” notwithstanding subsequent technological or market developments. Id. at 398-99 (discussing William Kingston, DIRECT PROTECTION OF INNOVATION. KLUWER (1987)). See also Robert P. Merges, Uncertainty and the Standard of Patentability, 7 HIGH TECH. L.J. 1, n. 18 (1992) (noting Kingston’s proposal and critiques).
11 See Sichelman, supra, at 397-98 (discussing petty patents, which have relaxed nonobviousness standards, shorter terms, and could potentially be obtained for substantially novel products that do not introduce entirely new technological subject matter.)
12 The persistent risk of both technological and market spillovers is a recognized barrier to investing in enterprises that rely on new technology. See, e.g., Branscomb & Auerswald, Overcoming Barriers, in TAKING TECHNICAL RISKS, at 139, n. 1.
13 I define commercialization awards as government financing, such as cash, loans, equity, with the purpose of increasing and/or accelerating the pace of commercialization of applied science and technology-based research. See Part II.B infra.
14 See Lemley, supra, at 149 (warning against eliminating the “discipline of a competitive market” by giving companies rights to exclude beyond those necessary to induce invention). See also Mark Lemley, Property, Intellectual Property, and Free Riding, 83 TEX. L. REV. 1031, 1058-61 (2005) (summarizing types of costs that an IP can impose on a society).
market,” as Lemley implies. They are the pro-market alternative to direct government financing for commercialization of emerging technologies. Thus, the question to be asking is not whether we need additional incentives to encourage commercialization: the government has already decided that we do. Rather, the question to be asking is whether novel patent-based incentives for commercialization are necessary in light of existing non-patent alternatives. The main goal of this Article is to answer this question.

In order to understand proposals for new forms of commercialization patents and the argument for commercialization incentives, in general, it is necessary to first understand why traditional patents for inventions are thought to be insufficient for promoting commercialization. Therefore, I begin in Part I.A., by explaining the main theoretical models for how patents are said to promote invention and commercialization of inventions. In Part I.B., I introduce the argument that patents, as currently structured, under-reward commercialization and that new forms of IP, such as commercialization patents, are consequently required. In Part I.C., I explain that, although I am wary of proposals for commercialization patents, I agree that patents for invention alone will not reliably effectuate commercialization of all or even most inventions with significant commercial promise, let alone inventions that will be of high long-term social value. A variety of theoretical market failures potentially justify government intervention. These include the high cost and risk associated with commercializing; information asymmetries between investors and entrepreneurs with unproven track records; and the fact that commercialization itself is likely to produce substantial new information that is vulnerable to free-riding. Thus, by creating additional incentives to commercialize selected inventions, governments can theoretically capture social spillovers that would not otherwise be generated.

In Part II, though, I show that a variety of financial incentives are already available at the federal and local levels to help companies commercialize both patented and unpatented inventions. As discussed in Part II.A., around twelve federal research agencies, including the Department of Defense (DOD) and the Department of Health and Human Services (HHS), offer awards ranging from around $150,000 to $1 million for small businesses that are developing inventions with commercial potential through the Small Business Innovation Research (SBIR) program, and the smaller Small Technology Transfer Research (STTR) program, which is directed at small businesses that partner with research institutions.
However, drawing on work by Matthew Keller and Josh Lerner, I show that ensuring near-term commercialization is not actually SBIR’s primary goal at all. Rather, like U.S. patents, SBIR’s goal is to incent generation and disclosure of new technological information.\(^2\) And, with important exceptions,\(^2\) to the extent commercialization is a goal, SBIR is not particularly effective at supporting small businesses’ commercialization needs.\(^3\)

In Part II.B., I reveal that U.S. states take the opposite approach to promoting innovation. States do not grant patents for new inventions.\(^4\) And they provide comparatively little funding for basic academic research.\(^5\) But states employ a wide variety of incentives for “applied” research that is already being commercialized or is likely to be commercialized in the near future.\(^6\) Whether directed at private enterprises or at private enterprises that collaborate with research institutions, the purpose of these incentives is remarkably similar to that of the new forms of patents discussed above: to turn inventions into innovations.\(^7\) Drawing on a wide selection of state statutes and administrative codes, I describe and categorize these incentives, which several states expressly refer to as commercialization awards. Awards range in size from around $30,000 to $2 million in cash, loans, or equity, and come in two main types: derivative state commercialization awards for selected prospective or past winners of federal SBIR awards,\(^8\) and independent state commercialization awards for companies that are in the process of developing a wide range of applied technological research.\(^9\) States’ overall expenditures on these awards are not

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\(^{21}\) See Branscomb & Auerswald, Overcoming Barriers, in TAKING TECHNOLOGICAL RISKS, supra, at 153-154.

\(^{22}\) As discussed in Part II.A., there are exceptions where the federal government takes more active steps to facilitate near-term commercialization, including especially technology related to defense and security. See Matthew Keller, The CIA’s Pioneering Role in Public Venture Capital Initiatives, in STATE OF INNOVATION 110-111 (Fred L. Block & Matthew R. eds. 2010).

\(^{23}\) For detailed discussion of the flaws in SBIR’s commercialization strategy, see Part II.A., infra.


\(^{25}\) For recent statistics on federal versus state funding for academic research, see NATIONAL SCIENCE BOARD, SCIENCE AND ENGINEERING INDICATORS, CHAPTER FIVE: ACADEMIC RESEARCH AND DEVELOPMENT 10-11, 14, Figure 5-7, (2012), available at http://www.nsf.gov/statistics/seind12/pdf/e05.pdf. See also Hemel & Ouellette, supra, at 321 (noting that the federal government spends well over $100 billion per year on research grants and prizes, while in the fiscal year 2009 states spent $3.6 billion on support for R&D at state universities and another $1.3 billion on other grants and facilities for in-state research.)

\(^{26}\) In this paper, I generally think of “basic” versus “applied” research “as research with no commercial value which lays a foundation for commercial products.” But I recognize that this distinction is “shaky,” especially when “basic” research is patentable. See Suzanne Scotchmer, Ideas and Innovations: Which Should be Subsidized 18 (NBER working paper, January 11, 2011).

\(^{27}\) See, e.g., Auerswal & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 53 (describing expressed goal of commercialization programs like New York’s and Minnesota’s as being to “move the technology forward into the market place, enhancing the likelihood of private investment, and capturing jobs for the local community.”)


\(^{29}\) For detailed descriptions of awards in five states, see Part II.B.2. On state financing programs directed at early stage technology development and commercialization, generally, see Dan Berglund & Christopher Coburn, PARTNERSHIPS: A COMpendium of state and federal cooperative technology programs 26-28 (1995) (containing a comprehensive survey of state technology programs circa 1995); Auerswal & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 52-53 (discussing state financing programs for ESTD and commercialization along with private, federal, and university financing options); Maryann Feldman & Maryellen Kelley, How States Augment the Capabilities of Technology-Pioneering Firms, 33 GROWTH AND CHANGE 173-195 (2002) (discussing state programs to assist technology development, including venture capital and matching funds); STATE SCIENCE & TECHNOLOGY INSTITUTE REPORT, TRENDS IN TECHNOLOGY-BASED
insubstantial.30 And although some entrepreneurs complain awards are too small to meet their financing needs, at least in some regions, state awards are “pursued to a greater degree than federal programs [.]”31 Moreover, recent research suggests that when state governments act as financiers of early stage technology development, they enhance companies’ chances of securing follow-on financing from private investors with deeper pockets.32 In the final section of Part II, I provide a case study based on a Yale faculty entrepreneur who received financing from the state of Connecticut in order to illustrate how state awards typically work in practice.

Shifting from the descriptive to the normative, in Part III, I draw on the typical metrics scholars use to compare patents to other forms of incentives like grants and prizes33 in order to compare federal and state commercialization awards with newly proposed commercialization patents. Patents are thought to be superior to direct financing because they avoid the necessity of government identifying and evaluating emerging technology and the risk that government will waste public money on inventions that turn out to be
unviable. An additional comparative benefit along these same lines is that patents avoid the risk of government directing subsidies towards politically popular projects that are not true innovations.

However, in Part III.A-B., I show that when it comes to financing commercialization of inventions that already exist and may themselves already be patented, government can reduce the risks associated with direct government administration of awards. The main strategy in this respect is to make government assistance contingent on securing co-investment from non-government sources like angels and venture capital firms. By mandating that awardees simultaneously obtain matching funds, government can draw on private information and decisions regarding inventions’ commercial viability, even as it spends public money to correct market failures. All the U.S. state programs I found employed this strategy, and empirical research on successful national programs in countries such as Israel suggests that matching requirements were a central factor in their success. A similar strategy to reduce the risk of investing, used in both U.S. federal and state programs, is to grant awards in stages based on progressive showings of success, such as reaching performance benchmarks or raising additional capital – sometimes called staged financing. Finally, awards can draw on the “signals” imparted in patents to help them assess an enterprise’s merit, as private investors already arguably do.

As a result, commercialization awards possess, to some degree, the major benefit associated with commercialization patents – drawing on the knowledge and skill of decentralized private actors to price innovation – but without generating the oft-discussed social costs of exclusive rights like deadweight loss and hindrance of innovation. An added upside of commercialization awards is that, unlike commercialization patents, they can be obtained for unpatentable subject matter, meaning that they limit distortion of investment towards innovations for which patents would provide strong incentives. Obviously, commercialization awards also come with significant downsides – only some of which can

34 For discussion of this view and Harold Demsetz in particular, see Kapcynski, supra, at 974-75 (“Instead of relying on government officials to guide inventive effort, property rights harness the power of price to transmit information between consumers and decentralized creators.”)

35 See, e.g., Ibrahim, supra, at 736-37 (on downsides of state VC financing). See discussion of this problem in Part III.C.


37 In his recent assessment of direct government incentives to stimulate entrepreneurship and boost venture capital in various countries, Josh Lerner also emphasizes the importance of matching requirements as a way to “let the market provide direction” in deciding how to spend public money, and notes that the most successful programs he has studied such as Israel’s used matching funds to direct where public subsidies should go. See Josh Lerner, BOULEVARD OF BROKEN DREAMS: WHY PUBLIC EFFORTS TO BOOST ENTREPRENEURSHIP AND VENTURE CAPITAL HAVE FAILED – AND WHAT TO DO ABOUT IT 183 (2009).

38 On staged financing as a performance incentive and a means to reduce risk, see Gilson, supra, at 1078-81.


41 See Amy Kapcynski & Talya Sayed, The Continuum of Excludability and the Limits of Patents, 122 YALE L.J. 1900, 1905 (2013) (arguing that “patents will systematically underreward research because they yield less than full appropriability”). The fact that state incentives, in particular, can provide supplemental protection for unpatentable subject matter has been noted in a variety of contexts. See, e.g., Douglas Gary Lichtman, The Economics of Innovation: Protecting Unpatentable Goods, 81 MINN. L. REV. 693 (1997) (noting that state anti-copying laws can promote investment in unpatentable goods that the patent system neglects); Arthur Miller, Common Law Protection for Products of the Mind: An Idea Whose Time Has Come, 119 HARV. L. REV. 703 (2006) (proposing stronger state laws for prohibiting copying of undeveloped ideas).
be cured by instituting design features such as matching requirements.\textsuperscript{42} The most oft-discussed problems are related to political economy: namely, politicians’ focus on short-term gains and political wins such as job creation, rather than true innovation.\textsuperscript{43} Another, potentially more incurable of these downsides actually stems from the fact that commercialization awards do not create new property rights in information produced during the process of commercialization and do not codify that information in a standardized government document; thus, they do not permit full internalization of benefits and do not, on their own, facilitate transactions around otherwise unpatented information related to commercialization.\textsuperscript{44} I address these concerns in detail in Part III.C.

My main point is not to make an airtight case that commercialization awards are more efficient; I simply suggest that they might be. Since we already have awards and don’t have commercialization patents, introducing the latter would be unwise, particularly given the anti-patent climate among politicians, academics, and the media,\textsuperscript{45} and the empirical uncertainties regarding whether patents promote innovation.\textsuperscript{46}

I conclude that, in light of the existence of commercialization awards at both the federal and state levels, new forms of commercialization patents are probably both unnecessary and unwise. Importantly, this Article does not address the distinct issue of whether traditional U.S. patents, as presently designed, are necessary for promoting innovation. In fact, if anything, this Article suggests that patents may be playing an important role in facilitating commercialization by permitting disclosure of new inventions and by signaling their potential value to private and government financiers. In other words, commercialization awards are supplements to traditional patents, not replacements.

I. Theoretical Models For How Patents Promote Commercialization

From the economic perspective, patents are justified as one possible way to give private actors greater incentives to innovate then they would otherwise have.\textsuperscript{47} In the next sections, I introduce traditional models for how patents promote the invention and commercialization aspects of innovation. I then discuss arguments that under-commercialization of inventions justifies introducing entirely new forms of patent rights (i.e."

\textsuperscript{42} Based on years of research, Lerner has summarized what he sees as the main downsides of government venture capital programs and has provided a variety of recommendations for improvement. See Lerner, BOULEVARD OF BROKEN DREAMS, supra, at 181-90; Lerner, Boulevard of Broken Dreams: Innovation Policy and Entrepreneurship, in INNOVATION POLICY AND THE ECONOMY 61-81 (Josh Lerner and Scott Stern, eds. 2013).

\textsuperscript{43} See, e.g., Lerner, Boulevard of Broken Dreams, supra, at 16-17; Feldman & Kelley, supra, at 191 (recognizing that “[m]ost state governments evaluate the outcomes of their science and technology programs in terms of the gains in employment from the growth of companies within its jurisdiction” and that their “emphasis on local employment growth may be short-sighted.”)

\textsuperscript{44} See Abramowitz & Duffy, supra, at 342, 405-407 (observing that, with exceptions, patents currently do not protect information related to market experimentation). On the theoretical benefits of property rights for facilitating transactions around inventions, see, e.g., Kitch, supra, at 266-77; Kieff, supra, at 703; Merges, A Transactional View of Property Rights, 20 BERKELEY TECH. L. J. 1477 (2005).

\textsuperscript{45} For a thorough review of both sides of the current debate over patent assertion entities among academics, politicians, and the media, see Ryan Holte, Patent Trolls or Great American Inventors: Case Studies of Patent Assertion Entities 4-15 (March 14, 2014) (unpublished manuscript, on file with author).


\textsuperscript{47} See Burstein, supra, at 235-36. See also, e.g., SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 38 (2004) (“Intellectual property protection gives innovators an incentive to invest in new knowledge. However intellectual property protection is not the only way to do that.”)
commercialization patents). I conclude this part by explaining why this argument is, in some respects, a useful addition to theoretical accounts of how government should respond to the problem of informational spillovers in crafting innovation policy, but I then go on in Parts II and III to cast doubt on the necessity for commercialization patents.

A. Traditional Justifications For Patents and Commercialization Theory

In the traditional incentives model, patents are thought to promote innovation in three main ways. First, by giving inventors the opportunity to obtain exclusive rights to make, use, and sell novel and “nonobvious” inventions for twenty years, patents give inventors an increased incentive to derive new inventions, secure in the knowledge that they will be protected from copying and competition for a limited period. Second, by mandating disclosure of inventions in exchange for an exclusive right, patents encourage inventors to reveal information they might otherwise keep secret and impart useful technical subject matter to others. Third, patents are believed to encourage investment in developing and commercially exploiting patented inventions, since patents only have economic value if the underlying inventions come to have economic value. Michael Burstein refers to this as the “commercialization imperative” feature of patents.

Although the notion that patents indirectly promote commercialization has a strong theoretical and historic basis, some scholars have argued that the commercialization imperative gets short shrift in traditional accounts of the patent system, which tend to focus mainly on invention and disclosure and to underemphasize the difficulty and importance of subsequent efforts to develop and commercialize. This argument is frequently associated

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48 See Fritz Machlup, An Economic Review of the Patent System (Subcomm. on Patents, Trademarks, and Copyrights of the S. Comm. on the Judiciary, Study No. 15, 85th Cong., 2d Sess. (Comm. Print 1958), at 21 (describing the “reward by monopoly” justification for patents). See also 35 USC § 154 (describing contents and term of patent right); § 102 (novelty), § 103 (nonobviousness).

49 Machlup, supra, at 21 (describing the “exchange-for-secrets” justification for patents). See also 35 U.S.C. 112 (a). Whether patent specifications actually “teach” useful information to other innovators is subject to debate; and it is doubtful that the teaching function of patent specifications can be considered the primary function of patents. See Lisa Larrimore Ouellette, Do Patents Disclose Useful Information?, 25 HARV. J.L. & TECH. 545, 548 (2012) (concluding that patent specifications can but do not always provide useful information to nanoscience researchers).

50 See Machlup, supra, at 21 (describing the “monopoly profit-incentive” feature of patents, which assumes patents are “the simplest, cheapest, and most effective way” “to make it worthwhile for inventors and capitalist backers to make their efforts and risk their money” in “inventions and/or their exploitation.”) See also Robert Merges, Commercial Success and Patent Standards, supra, at 809 (“[T]he patent system rewards innovation only indirectly, through the granting of patents on inventions.”) For historic views that the basic structure of patent rights forces inventors to seek patents only on potentially profitable inventions, see ADAM SMITH, Lectures on Jurisprudence 82-83, quoted in MERGES & DUFFY PATENT LAW AND POLICY: CASES AND MATERIALS (2007), at 7, n. 20 (“noting that “if the invention be good and such as is profitable to mankind, he will probably make a fortune by it; but if it be of no value he also will reap no benefit.”). See also Lowell v. Lewis, 15 Fed. Cas. 1018, 1019 (C.C.D. Mass. 1817) (“whether [the invention] be more or less useful is a circumstance very material to the interests of the patentee.”)

51 Burstein, supra, at 237.

52 See Kitch, supra, at 266 (“The reward theory is not questioned on its own terms. Rather, it is argued that the reward theory often offers an incomplete view of the function of the patent system.”); Kieff, supra, at 703 (the “treatment of patents as property rights is necessary to facilitate investment in the complex, costly, and risky commercialization activities required to turn nascent inventions into new goods and service.”); Sichelman, supra, at 354 (arguing that the dominant reward theory of patent law is too “invention-centric” and “fails to take proper account of the supernormal risks and costs of unpatentable post-invention commercialization
with Edmund Kitch, who argued in 1977 that patents serve not so much to “reward” invention as to create incentives to maximize the value of inventions following patenting.\textsuperscript{53} Several pieces of Kitch’s argument have been questioned – particularly his assertion that granting one firm control over the development of an invention is desirable for innovation because it reduces investment in duplicative research.\textsuperscript{54} However, Kitch’s conceptual framework does not necessarily turn on the contention that patents efficiently consolidate the rights to develop an invention in a single owner.\textsuperscript{55} Rather, as drawn out by later scholars, the main point of this line of thought is that, because commercialization is costly, risky, and vulnerable to free-riding, patents or some other forms of exclusive rights may be necessary to protect commercialization efforts well beyond invention.\textsuperscript{56}

The commercialization-enhancing justification for patents was influential in the 1980s, during debates over whether Congress should encourage more patenting of federally funded research.\textsuperscript{57} And the argument has particular traction in the pharmaceutical industry, where costs of development are high, testing times are long, copying by generics is easy, and regulatory barriers are extensive – all of which can make commercialization in the absence of exclusive rights extremely difficult.\textsuperscript{58} Moreover, as I am about to discuss, concerns about commercialization also frequently arise in the context of entrepreneurship, where new or young companies may rely on patents as a way to secure financing from private investors following invention.\textsuperscript{59}

\textsuperscript{53} Kitch, supra, at 266, 276-77 (“the patent owner has an incentive to make investments to maximize the value of the patent without fear that the fruits of the investment will produce unpatentable information appropriable by competitors.”)

\textsuperscript{54} Robert Merges & Richard Nelson, On the Complex Economics of Patent Scope, 90 Col. L. Rev. 839, 873-74 (1990) (questioning Kitch’s assumption that innovation can proceed efficiently if a single owner possesses all the rights to develop and license the invention, especially given the transaction costs involved in seeking outside inputs.) John Duffy has questioned Kitch’s assertion that the benefit of granting patents early in the innovation process is to avoid duplicative research efforts; instead, Duffy argues, early patenting serves to put innovations in the public domain faster. See John Duffy, Rethinking the Prospect Theory of Patents, supra, at 443-49. See also Burstein, supra, at 258-74 (questioning the assumption that efficient exchange of information about inventions is not possible without patents.) For recent discussion of critiques of Kitch, see also Hemel & Ouellette, supra, at 360-61.

\textsuperscript{55} See Sichelman, Markets for Patent Scope, 1 IP THEORY 42 (2010) (arguing that critiques of Kitch’s theory focus on Kitch’s assumption that broad, early rights efficiently allocate resources towards different innovations and “mostly ignore Kitch’s concerns about commercialization.”) But see Hemel & Ouellette, supra, at 360-61 (“It may be that the winner-takes-all incentive of a patent is the key driver of innovation, but this is simply a restatement of one of the main arguments for \textit{ex post} mechanisms over \textit{ex ante} mechanisms, as we have already discussed.”)

\textsuperscript{56} Sichelman, supra, at 356-57, 372-74; Abramowicz & Duffy, supra, at 337-40. See also Kieff, supra, at 703; Burstein, supra, at 240 (noting that “Kieff grounds his theory upon the same free-rider problem that plagues initial development of new technology.”) For more detailed discussion of post-Kitch developments, see Burstein, supra, at 239-45.

\textsuperscript{57} Rebecca Eisenberg, Public Research and Private Development: Patents and Technology Transfer in Government-Sponsored Research, 82 VA. L. REV. 1663, 1669 (1996) [hereafter “Public Research”] (explaining that advocates of allowing patenting of federally funded research “set aside as secondary the standard justification for patents as an \textit{ex ante} incentive to make new inventions, and shift the focus from the initial costs of making an invention to the subsequent costs of developing an existing invention into a commercial product.”)

\textsuperscript{58} See, e.g., W. Nicholson Price, Making Do in Making Drugs: Innovation Policy and Pharmaceutical Manufacturing, BOSTON COLLEGE L. REV. (forthcoming 2014) (arguing that IP incentives to innovate in pharmaceutical manufacturing are too low).

B. Extending The Logic Of Commercialization Theory to New Patent Rights

As Burstein recently observed, “the logic of providing incentives for commercialization can extend beyond the patent system as it currently exists.” The argument for doing so rests on the theoretical, if not fully empirical, premise that patents currently provide insufficient incentives to commercialize inventions due partly to the risk of informational spillovers that are not captured by traditional patents on inventions. A cohesive foundation for this argument can be found in Michael Abramowicz and John Duffy’s influential article, *IP for Market Experimentation*, where they argue that modern patent law protects information associated with technological experimentation, but neglects information associated with “market experimentation,” defined as “the commercial test of a product or service that is new to the market in which it is launched and has uncertain prospects for commercial success.” After all, commercialization activities, just like inventive activities, can produce new information that is difficult to value and that is subject to free riding. Thus, they argue, this type of information should potentially be patentable as well, and suggest a few ways through which this could be accomplished, including allowing patents for “smallish variations” of previously failed innovations or for products that have never been effectively commercialized, so long as the development is both “new and commercially nonobvious” and vulnerable to free riding by others.

In his article, *Commercializing Patents*, Ted Sichelman builds on Abramowicz and Duffy’s arguments, focusing specifically on the problem of under-commercialization of inventions for which U.S. patents have actually been obtained. Noting that “about half, probably more” of all patented inventions are never commercialized, Sichelma argues that the reason is not that these inventions lack value. Rather, commercialization is hindered due to high costs, the difficulty of raising capital, and the risk that new information derived during commercialization will quickly be copied – all of which may lead inventors and their financial backers to demand higher returns than patents alone provide in order to justify

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60 See Burstein, supra, at 240 (observing that “the logic of providing incentives for commercialization can extend beyond the patent system as it currently exists.”)

61 See Abramowicz & Duffy, supra, at 342 (arguing that strong theoretical arguments exist suggesting that the existing level of market experimentation is too low); Sichelman, supra, at 380 (describing “theoretical arguments and empirical evidence showing that the patent system, in significant part, very likely causes low rates and elongated timelines of commercialization for many valuable patented inventions.”) See also Lichtman, supra, at 693 (arguing that sui generis protection for innovations like semiconductors and boat hulls can provide evidence of under-investment in otherwise unpatentable innovations.)

62 Abramowicz & Duffy, supra, at 339, n. 4.

63 Id. at 341 (comparing spillovers from market experimentation to spillovers from technological experimentation).

64 See id. at 406-407.

65 Notably, Sichelma does not recommend extending patentable subject matter to include commercial nonobviousness, instead limiting his proposal to the same types of subject matter that are currently patentable. Sichelma, *Commercializing Patents*, supra, at 396-97 (suggesting allowing patents for market innovations would require too much discretion by the PTO to determine commercial nonobviousness).

66 Id. at 343.
investment. As a solution, Sichelman proposes introducing a legal innovation without a direct historic precedent: commercialization patents. Commercialization patents could be obtained for “substantially novel” products of “the same types...as those within the scope of traditionally patentable subject matter.” The underlying invention must already have been patented but not yet commercialized within three years. Commercialization patents would have shorter-term lengths than regular patents and would come with an affirmative duty to commercialize within that time (i.e. a working requirement), as well as limited immunity from suits by holders of invention patents.

As mentioned in the Introduction, scholars like Lemley have objected to these “ex post” commercialization-based justifications for exclusive rights. Removing “the discipline of a competitive market” by granting a single company the right to develop an innovation, Lemley asserts, would result in less efficient outcomes than if companies are forced to develop inventions and compete with others to make them a market success. By this logic, if inventors and private developers fail to commercialize an invention, this is probably because it lacks technological or commercial merit, and it would be a mistake to offer exclusive rights to inventions that are never commercialized. However, to the extent that Lemley suggests no government incentives of any type are required to support commercialization of patented or unpatented inventions, I disagree. To the contrary, theory suggests that intervention in markets for innovation is sometimes justified, especially when high-tech research and entrepreneurs are involved.

C. Justifying Government Incentives to Promote Commercialization

As many scholars of patent and innovation policy have emphasized, invention is just one step in a potentially long and costly process towards bringing inventions to market. Lewis Branscomb and Philip Auerswald divide the process of innovation loosely into five stages: basic research; proof of concept/invention (patentable or unpatentable); early-stage technology development (ESTD); product development; and production and marketing. In their model, ESTD – defined as “the technical and business activities that transform a commercially promising[patentable or unpatentable] invention into a business plan that can attract enough investment to enter a market successfully, and through that investment become a successful innovation” – is a crucial stage in technology development that precedes and/or accompanies the start of typical commercialization activities like production.

[67 See id. at 354 (contending that just as invention “produces information subject to free riding, so does commercialization [and that] the risks of commercializing inventions regularly demand supernormal returns to justify taking them.”)]
[68 But see id. at 397-400 (discussing existing and proposed options, such as petty patents and innovation warrants, that closely resemble commercialization patents).]
[69 Id. at 346.
70 Id.
71 Id. at 346.
73 See id.
74 Branscomb & Auerswald, Between Invention and Innovation, in TAKING TECHNOLOGICAL RISKS, supra, at 8-29. See also discussion and citations in Burstein, supra, at 237-39.
75 Auerswald & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 33.]
and marketing. During ESTD, sometimes called the “Valley of Death,” the risk of under-capitalization and inability to find investors is at its peak.

Corporations, venture capital investors (VCs), and angel investors are the major private sources of financing for ESTD and commercialization. But profit-motivated investors may under-invest due to various reasons, of which I’ll describe three. The first reason, stressed in IP scholarship, is that firms may be unable to capture the benefits of new information generated during the course of monetizing the idea. The risk of free riding is not limited to technological spillovers, which occur when other firms benefit from information produced as a result of R&D; innovation can also produce market spillovers, where other participants in the markets affected by an innovation benefit without compensating the original innovator. Obtaining IP does not necessarily prevent either type of spillover because IP may under-reward or simply not protect the type of information that is produced. As a result, cautious, profit-focused investors may be unwilling to invest in new research, especially in cases involving true technological or market breakthroughs, resulting in funding gaps that can be hard to over-come without government support.

A second type of innovation market failure results from informational asymmetries between financiers and young or newly formed companies that lack a track record of success. Although entrepreneurs always have this problem, the information and trust gap is likely to be particularly pronounced when new technology is involved because it is so difficult for non-technologists to evaluate the technology and communicate with its makers. As a result, even when an objective analysis would show that the innovation has a high chance of being profitable in the near future, investors may not reach this understanding.

A third type of market failure can arise due to constrained availability of credit, either across-the-board or in a certain geographical location. This means that innovative and value-adding innovations that might normally go forward are neglected at particular times or in particular regions.

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76 Id. at 1.
77 Id. at 35.
78 Id. at 3-4, 42-51. For thorough recent analysis of VC and angel investing in technology start ups, see Ibrahim, supra, at 733-36 (private venture capital), 738-53 (angel investors).
79 Branscomb & Auerswald, Overcoming Barriers, in TAKING TECHNOLOGICAL RISKS, supra, at 139. See also Abramowicz & Duffy, supra, at 364-65 (arguing that “[f]inanciers have incentives not to be overly confident about the likelihood of success, and there is considerable evidence of realism from the venture capital side with regard to concerns of imitation in the market.”) 80 See Branscomb & Auerswald, Overcoming Barriers, in TAKING TECHNOLOGICAL RISKS, supra, at 139, n. 1. See also Frischmann, supra, at 363-64.
81 See Branscomb & Auerswald, Between Invention and Innovation, in TAKING TECHNOLOGICAL RISKS, supra, at 139, n. 1. See also Frischmann, supra, at 363-64.
82 See Branscomb & Auerswald, Between Invention and Innovation, in TAKING TECHNOLOGICAL RISKS, supra, at 12. Importantly, there are other reasons besides market spillovers that VCs might find a company too risky, such as a general preference for investments that will become liquid as quickly as possible, such as through an IPO or sale to another company. See Gilson, supra, at 1074-75.
83 See Ibrahim, supra, at 733-36.
84 See Branscomb & Auerswald, Between Invention and Innovation, supra, at 12 (describing the information an trust gap that exists between technologists on one side and investors/managers on the other.) See also Gilson, supra, at 1076-77 (“investing in early stage, high technology companies presents this problem [of uncertainty, information asymmetry and agency cost] in an extreme form.”)
85 VC markets are cyclical and may be limited to certain geographic areas, such as Silicon Valley. Ibrahim, supra, at 746-47 (geographic limits of VCs); McGuire, supra, at 424-25 (contractions in VC markets).
86 See McGuire, supra, at 423-25.
Given these potential market failures in high-technology development, in the next part of the Article I start from the assumption that it is good policy for government to provide incentives directed at companies that are unable to commercialize a potentially promising innovation on their own. By providing targeted incentives for ESTD and commercialization activities, government can supplement private markets, helping investors to identify and afford investments that could lead to net gains if effectively commercialized.\(^87\)

II. A Descriptive Account of Federal and State Commercialization Awards

As just explained, theory suggests the naked market, even when modified by patents on inventions, may not provide sufficient incentives to invest in commercially risky but value-adding research. However, in this part of the Article I show that we already have a system in place for facilitating commercialization: commercialization awards at both the federal and state levels. As I explain in detail below, the federal government takes a relatively hands-off approach to promoting commercialization and may not be effective at doing so. But U.S. states offer a variety of financing options with the specific goal of promoting and accelerating the pace of commercialization of patented and unpatented inventions in their jurisdictions. Before considering introducing wholly new forms of IP for commercialization, we must take a close look at existing incentives. This part is largely descriptive but notes significant prior assessments of the efficacy of these programs.

A. Federal Commercialization Awards

The U.S. federal government has generally been hesitant to provide direct financing for companies trying to commercialize cutting-edge research.\(^88\) But various exceptions exist, including where the government is the ultimate consumer of a technological input (e.g., defense, energy); where a major government mission depends on industrial innovation (e.g., heath, environment); or politically attractive programs such as support for small businesses.\(^89\) It is in this latter category that we find the major broad-based federal incentives for companies trapped in the Valley of Death: the Small Business Innovation Research Program (SBIR).

Created by Congress in 1982, SBIR provides small businesses the opportunity to obtain financing for early stage technology development and commercialization.\(^90\) The Small Technology Transfer Research program (STTR), created in 1992, creates similar awards for small businesses that engage in “cooperative research and development” with research institutions.\(^91\) In 2010, federal agencies’ SBIR obligations totaled around $2.3 billion, and

\(^{87}\) See Auerswald & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 1-4 (describing federal and state government funding sources during ESTD).

\(^{88}\) See Keller, supra, at 111; Branscomb & Auerswald, supra, at 144 (“federal politics views with suspicion government programs to assist individual firms.”); Berglund & Coburn, supra, at 483 (noting federal government’s slow entry into cooperative technology development programs that directly engage industry for the express purpose of enhancing economic growth.)

\(^{89}\) See Branscomb & Auerswald, supra, at 144 (citing work by Auerswald & Keller).


\(^{91}\) Not less than 40% of the work can be performed by the small business, and not less than 30% can be performed by the institution. See 15 U.S.C. § 638(e)(7) (describing cooperative R&D relationship required for STTR). STTR was created in P.L. 102-564. It was re-authorized until 2017 in P.L. PL 112-81. See also Auerswald & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 73-75; Branscomb &
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STTR obligations totaled around $245 million, with the DOD issuing the majority of the awards.92

1. SBIR’s “Indirect” Commercialization Strategy

SBIR was created during the same period in which Congress passed the Bayh-Dole Act, which, among other things, encouraged small businesses to retain patent rights to federally funded research, ostensibly to give them greater incentives to commercialize their research results.93 And one of the statutory purposes of SBIR is to “increase private sector commercialization innovations derived from Federal research and development.”94 However, SBIR is not a centralized, open-ended awards program for companies interested in obtaining risk capital to pursue ESTD and commercialization.95 It is a set-aside mandate, requiring that federal agencies spending over $100 million annually on extramural research contracts must reserve a portion of their budgets for “funding agreements”96 with for-profit small businesses with under 500 employees.97 Each agency must offer its own SBIR/STTR awards, to be administered in three phases. Phase I awards, which come in the form of non-debt, non-equity capital, cannot exceed $150,000.98 They are granted based on the “scientific and technical merit and feasibility of ideas that appear to have commercial promise.”99 Phase II awards, potentially up to $1 million, are granted based on the small business’ “record of commercializing SBIR or other research” and its success in obtaining follow-on funding.

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92 In 2010, the DOD issued $1.3 billion awards under SBIR and $135 million under STTR. The Department of Health and Human Services (HHS), which includes the NIH, issued $624 million under SBIR and $73 million under STTR. Recent statistics available here: http://www.sbir.gov/awards/annual-reports, http://www.sbir.gov/awards/annual-reports?program=STTR&year=2010
93 See Eisenberg, Public Research, supra, at 1665 (explaining that the Bayh-Dole Act of 1980 “encouraged small businesses and nonprofit organizations to patent the results of government-sponsored research by allowing them to retain patent ownership themselves, provided they were diligent about getting patent applications on file and promoting commercial development of the inventions.”)
94 The statutory purpose of SBIR is: “(1) to stimulate technological innovation; (2) to use small business to meet Federal research and development needs; (3) to foster and encourage participation by minority and disadvantaged persons in technological innovation; and (4) to increase private sector commercialization innovations derived from Federal research and development.” P.L. 97-219, Sec. 2(b).
95 Branscomb & Auerswald, Overcoming Barriers, in Taking Technological Risks, supra, at 149-50.
96 The statute defines “funding agreement” as “any form of grant, contract or cooperative agreement.” 15 U.S.C. § 638(f)(3). See also 31 U.S.C. § 6303-6304 (federal guidelines for procurement, grants, and cooperative agreements). Brett Frischmann has observed, analyzing 31 U.S.C. § 6303-6304, that “procurement contracts” are used when the government has a need and end result in mind, while “grants” are used to support innovation “without a predetermined application or result in mind.” See Frischmann, supra, at 388 (grants), 390-92 (procurement and cooperative agreements).
97 Under SBIR, agencies must set aside 2.8% of their budgets; they must set aside .40% of their budgets for contracts with small businesses that collaborate with university researchers under STTR. 15 U.S.C. § 638(e)(4) (definition of SBIR), (f)(1)(E)-(F) (SBIR percentage goes to 2.8% in 2014), (n)(B) (STTR goes to .40% in 2014).
98 Funding agreements, see 15 U.S.C. § 638(e)(3), cannot involve direct cash assistance to an individual, a subsidy, a loan, loan guarantee, or insurance. 31 U.S.C. § 6302.
99 Id. at § 638 (e)(4)(A) (SBIR), §638 (e)(6)(A) (STTR).
commitments from “private sector or non-SBIR funding sources.” Phase III awards involve no government funding.

The theoretical commercialization strategy behind SBIR is that, by giving small businesses the opportunity to obtain federal funding for R&D, this will help small businesses confront the variety of innovation market failures discussed above, helping them to develop and bring to market research that they would not otherwise.

However, researchers in this area such as Josh Lerner have concluded that federal agencies that solicit for research through SBIR are not primarily concerned with the near-term commercial merit of selected projects. Rather, their main focus is on generation and diffusion of new technological information, or, in the case of nationally important areas like defense, the provision of applied research that the government wishes to procure for its own development and use. In other words, SBIR is directed primarily at meeting federal agencies’ research and technology procurement needs, not at promoting companies’ chances of generating products and services that will be viable in actual “commercial” markets.

2. Flaws With SBIR’s Commercialization Strategy

To the extent SBIR has commercialization as a secondary goal, empirical research suggests that it has serious flaws in this respect. First, SBIR-granting agencies generally restrict awards to specific research subjects based on the agencies’ own goals or on federal procurement needs. By statute, agencies must limit awards to ideas that “appear to have commercial potential.” However, “commercial potential” can simply indicate that the research will generate products or services that can be sold back to the federal government; it need not imply that any rational private investor would fund the company. Since agencies have extensive control over the content of their solicitations, they can stress business success is an important mechanism [of federal commercialization programs], but not a necessary condition for diffusion success. A project that was technically successful but failed in the market might be published and used by others in more promising markets.

Importantly, the statute defines “commercialization” to include the process of developing “products, processes, technologies, or services for sale to or use by the Federal Government or commercial markets.” Thus, federal agencies can contract out to small businesses for research the agency expects will generate “products, processes, technologies, or services” that the government might be buying in the future, regardless of whether it has short-term potential for success in actual commercial markets.

The statute gives participating federal agencies significant leeway to “unilaterally determine” which categories of projects and which research topics to finance and to issue solicitations of their own choosing.
commercial viability to varying degrees. At least some agencies appear to value good science far more than good business.\footnote{For instance, in the NIH’s omnibus SBIR solicitation notice, commercial viability is not stressed nearly as much as the project’s potential to improve the state of “scientific knowledge, technical capability, and/or clinical practice[.]” Reissue PHS 2013-02 Omnibus Solicitation of the NIH for Small Business Technology Transfer Grant Applications (Parent STTR [R41/R42), http://grants.nih.gov/grants/guide/pa-files/PA-13-235.html.}

Second, research suggests SBIR awards are too small and take too long to get.\footnote{Notably, the smallness of SBIR awards may be one reason Congress is willing to authorize them. See Branscomb & Auerswald, Overcoming Barriers, supra, at 150 (asserting that one of the ‘politically valuable’ features of SBIR is that “the grants are constrained by law to be sufficiently small that it is unlikely that competitors who have not received SBIR grants will complain of market distortions.”)} It can take months to hear back regarding an award application, during which time companies may run out of money; and even once a company receives a Phase I award, it may not be able to survive while waiting on the agency to approve a Phase II award.\footnote{On small size and slow pace of the awards see Berglund & Coburn, supra, at 26-27; Ross, supra, at 118-19 (describing DOD’s “fast track” options for companies experiencing funding gaps between phases), 122-27 (discussing states’ responsive derivative awards).} One study, mentioned in the introduction, concluded, based on surveys and interviews of companies in the eastern Midwest, that federal awards, especially when compared to other sources of funding, were seen by entrepreneurs as “exceedingly time consuming, often self-defeating, and in the end usually too small to be of enduring use.”\footnote{Feldman & Lanahan, supra, at 3-4.}

A final problem with SBIR awards as commercialization incentives is that it is very difficult for federal agencies to monitor award winners’ commercial success. By statute, award-granting agencies are theoretically obligated to track awardees’ progress. Congress requires participating agencies to create a public, searchable database containing information on all SBIR/STTR awards they make, including amount and subject matter, name and gender of the recipient, and (for STTR) information on the nature of the collaboration between the small business and the research institution.\footnote{See 15 USC § 638(g)(8), (i) (annual reporting requirements), § 638(k)(1) (required information for public database).} In addition, agencies must develop a private government database “to be used exclusively for SBIR and STTR program evaluation”\footnote{Required information includes, for instance, the number of employees employed by the awardee or its affiliates, whether the awardee obtained “venture capital, hedge fund or private equity firm investment as of the date of the award, and the amount of additional capital the awardee itself has invested in the company. 15 USC § 638(D) (information required on Phase I or II awards). For Phase II awardees, agencies must also collect data on revenues from the sales of new products or services resulting from R&D conducted with an SBIR or STTR award and information regarding additional investments “from any source” made to further the R&D conducted under the award; and any other information that the agency “considers relevant and appropriate” or that the small business voluntarily submits that “further described the outputs and outcomes of its awards.” 15 USC § 638 (B)-(C) (Phase II awards only).} that contains certain information regarding awardees’ progress towards commercialization.\footnote{U.S. Gov’t Accountability Office, Report to Congressional Committees No. 07-38, Small Business Innovation Research: Agencies Need to Strengthen Efforts to Improve the Completeness, Consistency, and Accuracy of Awards Data, GAO-07-38, Oct 19 (2006), at 17-18.}

However, as emphasized in a 2006 report by the Government Accountability Office (GAO), agencies do not strictly enforce commercialization requirements and face significant practical challenges in doing so.\footnote{U.S. Gov’t Accountability Office, Report to Congressional Committees No. 07-38, Small Business Innovation Research: Agencies Need to Strengthen Efforts to Improve the Completeness, Consistency, and Accuracy of Awards Data, GAO-07-38, Oct 19 (2006), at 17-18.} It can take years before companies achieve commercial success. “During this time, companies may move, change names, start a new business, or be
purchased by other firms, all of which make it difficult for the agencies to track and link companies to the original SBIR awards.\footnote{Id at 17.} Additionally, Congress has provided no uniform definition of what constitutes “commercialization success,” giving agencies “considerable latitude” to determine which “commercialization outcomes” – like sales revenue, receipt of additional non-SBIR funding, marketing activities, and public offering of company stock. Because agencies are not tracking the same outcomes, “assessing overall commercial success of the SBIR program across the various agencies remains a challenge.”\footnote{Id at 18.} Again, the main reason for these failures in facilitating and monitoring commercialization of new technologies may simply be that commercialization is not the primary goal of SBIR.\footnote{Branscomb & Auerswald, Overcoming Barriers, supra, at 150-54.}

Rather, like U.S. patents, to the extent SBIR promotes commercialization, it does so “only indirectly.”\footnote{See Merges, Commercial Success and Patent Standards, supra, at 809 (“[T]he patent system rewards innovation only indirectly, through the granting of patents on inventions.”)}

Importantly, I do not suggest that decentralization is the main reason for SBIR’s failings in efficiently generating commercialization incentives. As Arti Rai and Stuart Benjamin have pointed out, the United States’ general strategy of delegating innovation policy to disparate federal agencies without significant top-down oversight has costs, including “lack of focus on the regulatory objective[.]”\footnote{Benjamin & Rai, supra, at 56-57 (suggesting that although decentralization has benefits such as increased experimentation, these must be considered in relation to the costs of disuniformity.)} It may be that increased centralization – for instance, a single entity responsible for monitoring SBIR winners’ commercialization efforts – would improve SBIR’s facility at inducing commercialization.

B. State Commercialization Awards

In contrast to the federal government, U.S. states fund and administer a variety of programs whose express purpose is to help companies finance commercialization of inventions and access private capital. As I describe below, some states, like Indiana and Texas, expressly refer to these funding options as “commercialization awards.” I use the term State commercialization awards come in two main varieties: awards that are derivative of the federal SBIR program, and awards that states fund, design, and administer largely independently of the national government.\footnote{Although I focus here on state-administered programs, state-sponsored commercialization awards administered through universities could be a separate category of state commercialization awards. See, e.g., SSTI, supra, at 7 (describing Kansas’ new proof-of-concept fund, which is operated by the University of Kansas).} I discuss each below.

1. Derivative State Commercialization Awards

Many state commercialization awards are derivative of federal SBIR and STTR awards. As explained above, federal awards are difficult to apply for, small, and can take a long time to obtain. In response to concerns that small businesses will run out of money at some point in the process, over half the states have launched derivative SBIR programs designed to help local businesses obtain and leverage federal money.\footnote{As described by Berglund and Coburn, “these programs aid technology-based companies in gaining access to federal financing assistance programs.” Berglund & Coburn, supra, at 26. For a survey of “derivative” state-level incentives circa 2008, see also Ross, supra, at 115.}
come in three varieties: pre-award assistance, matching awards, and bridge financing.\textsuperscript{123} Below I provide examples of each.

\textit{Pre-award assistance.} Oklahoma’s SBIR Phase I Incentive Funding Program was designed to “financially support preparation of [SBIR] grant proposals by Oklahoma entities, and thereby increase Oklahoma’s share of [SBIR] funding.”\textsuperscript{125} The program defrays a portion of the costs for for-profit businesses of under 500 employees that have already submitted applications for Phase I awards.\textsuperscript{125} Vermont’s Small Business Development Center (SBDC) does not provide any funding, but it “provides no-cost, confidential business advising and low-cost training services to all small businesses and new ventures in Vermont,”\textsuperscript{126} including help applying for funding through the SBIR or STTR programs.\textsuperscript{127}

\textit{Matching programs.} The Kentucky SBIR Matching Funds Program, allegedly the first of its kind,\textsuperscript{128} matches up to $150,000 for Phase I awards and up to $500,000 for Phase II awards. Receipt of matching funds is contingent on location in Kentucky or re-location to Kentucky within 90 days of entering an award agreement. Recipients must reside in Kentucky for a minimum of five years after receipt of the award, over half the company’s property and payroll must be in Kentucky, and over half of the grant amount must be spent in Kentucky.\textsuperscript{129}

\textit{Bridge financing.} New York has a pro-active bridge financing program to help companies bridge the gap between Phase 1 and 2 SBIR awards. The authorizing statute provides that the New York State Science and Technology Foundation, a state corporation designed to promote science and technological education, research, and commercialization in the state,\textsuperscript{130} “shall, [within thirty days of SBIR award announcements,] contact all Phase I award recipients, whose principal place of business is located in this state, provide them with information concerning the [New York bridge financing program] and advise them of the requirements relating thereto.”\textsuperscript{131} In order to receive help, Phase I award winners must “certify that the research to be conducted will be performed solely in this state[.]”\textsuperscript{132} In addition, no moneys can be dispersed until the business actually completes the Phase I research and submits its final report to the appropriate federal agency.\textsuperscript{133}

2. Independent State Commercialization Awards

\textsuperscript{123} For examples of all three types, see Ross, supra, at 125. The Wisconsin Technology Commercialization Grant and Loan program, which Ross also discusses, is somewhat unusual in providing assistance at three stages of the financing process. See id. at 125 (concluding that Wisconsin’s approach is “unusually robust” after completing state-wide survey of all state derivatives of SBIR). See also Wis. Stat. 560.275(2)(a)-(c).

\textsuperscript{124} OK. Admin. Code. 650:30-1-1 (SBIR), 650:37-1-1 (STTR).


\textsuperscript{126} http://www.vtsbdc.org/

\textsuperscript{127} See http://www.vtsbdc.org/programs/small-business-technology-commercialization

\textsuperscript{128} Kentucky Cabinet for Economic Development, “Kentucky first state to match federal SBIR-STTR Phase 1 and Phase 2 grants,” 16-Nov-2006 (“The [Kentucky] program is the first in the United States to specifically match federal SBIR and STTR Phase 2 awards and is part of Kentucky’s plan to offer its high-tech small businesses comprehensive SBIR and STTR funding.”), http://www.eurekalert.org/pub_releases/2006-11/kcef-kfs111606.php

\textsuperscript{129} Information available at http://ksef.kstc.com/index.php/funding-programs/ky-sbirsttr-matching

\textsuperscript{130} N.Y. Code § 3101 (“The purposes of the corporation shall be to encourage and promote: 1. Scientific and technological education in the state; and 2. Basic and applied research and development in the state. 3. The development of new commercial products and the fabrication of such products in the state.”)

\textsuperscript{131} N.Y. Code § 31020-c.2.a

\textsuperscript{132} N.Y. Code § 31020-c.2.b.ii.

\textsuperscript{133} N.Y. Code § 31020-c.3.a-d.
States also sponsor independent award programs to accelerate commercialization of research in their jurisdictions. These incentives are not based on federal programs, but originate with the states themselves. This distinction has very important implications for the awards’ efficacy at promoting commercialization. As explained in Part II.A., SBIR awards only indirectly facilitate commercialization by mandating that certain federal agencies procure their research from small businesses; and they may not be effective at doing so in part because subject areas are limited to federal agencies’ research interests. In contrast, although some state awards are directed at particular technological fields (e.g., nanotechnology), most state awards are “technology agnostic.” They are not directed at companies developing research that meets a need perceived ex ante by the state, but at innovations that originate with innovators themselves. The main criteria for receiving a state commercialization award is that the project will produce results that can be commercialized in the very near future.

Below is just a short list of illustrative examples of state commercialization awards in five states. Awards can be project-based, meaning the state provides capital only for developing a particular project, or company-based, meaning the state provides operating capital to a new or young company for a variety of commercialization activities in the form of grants, low-interest loans, or equity. As will be seen below, although some awards programs are managed directly by the state, others are contracted out to private entities. This is an increasingly common model.

**Iowa Demonstration Fund.** Iowa’s Demonstration Fund, administered by the Iowa Economic Development Authority (IEDA), authorizes project-based funding, including loans, forgivable loans, and grants of up to $150,000 for “innovative businesses” in Iowa “with high growth potential” that are engaged in “high-technology prototype and concept development activities [with] a clear potential to lead to commercially viable products or services within a reasonable period of time[,]” in order to “help [them] reach a position where they are able to attract private funding.”

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134 See, e.g., Oklahoma Nanotechnology Application Project, Okla. Admin. Code 650: 8-1-1.2 (providing assistance for nanotechnology research activities whose results have a “high probability of leading to commercially successful products, processes or services within a reasonable period of time.”)

135 I borrow this term from an employee at Oklahoma’s funding program. Interview with Casey Harness, External Relations Coordinator, Director of the i2E Fellows Program, and Oklahoma Bioscience Association Liaison, in Oklahoma City, Okla. (December 20, 2013).

136 Suzanne Scotchmer calls rewards for innovations not identified in advance “blue-sky prizes” versus “targeted prizes,” which reward solutions to needs that originate with sponsors. Scotchmer, Innovation and Incentives, supra, at 40.

137 On the distinction between project and company financing, see Berglund & Coburn, supra, at 24-25.

138 According to Casey Harness at i2E, this model originated in Oklahoma. Interview with Casey Harness, External Relations Coordinator, Director of the i2E Fellows Program, and Oklahoma Bioscience Association Liaison, in Oklahoma City, Okla. (December 20, 2013).

139 See Iowa Code § 15.105, Iowa Admin. Code § 261-105.3(15)

140 “Innovative business” is defined in Iowa Code 15E.52(1)(c) as “a business applying novel or original methods to the manufacture of a product or the delivery of a service.”

141 Iowa Admin. Code § 261-105.2 (15) (purpose), 261-105.4(15) (project based). See also Iowa Code § 15.411.3. The Demonstration Fund provides loans of up to $150,000 and grants of up to $50,000. See Iowa Economic Development Authority website, http://www.iowaeconomicdevelopment.com/Entrepreneurial/DemoFund
additional financing for innovative businesses in the later stages or that partner with state universities in order to “accelerate the development of innovative ideas and businesses[.]”\(^{142}\)

**Indiana 21st Century Research and Technology Fund.** Indiana’s 21st Century Research and Technology Fund authorizes grants or loans, including Initiation Awards of up to $500,000 for companies in the proof-of-principle stage, and Commercialization Awards of up to $2 million “to accelerate product development and commercialization.”\(^{143}\) Since April, 2011, the Fund has been managed by Elevate Ventures, a nonprofit under contract with the Indiana Economic Development Corporation and the State of Indiana.\(^{144}\)

**Kentucky Enterprise Fund.** Kentucky’s Enterprise Fund, administered by the Kentucky Science and Technology Corporation (KSTC),\(^{145}\) authorizes seed stage capital for small and medium sized Kentucky-based companies working in partnership with Kentucky colleges and universities in order to “improve economic competitiveness, and spur economic growth in Kentucky-based companies” and “[s]upport feasibility, concept development, research and development, or commercialization activities that have clear potential to lead to commercially successful products, processes, or services within a reasonable period of time.”\(^{146}\) Awards range from under $30,000 to up to $750,000.\(^ {147}\) The Kentucky Commercialization Fund Program authorizes similar awards for university faculty members developing “technologies with commercial potential that are in their early stages of development.”\(^{148}\)

**Oklahoma Applied Research Support Program (OARS).** Oklahoma’s Applied Research Support Program, which is administered by the Oklahoma Center for the Advancement of Science and Technology (OCAST),\(^{149}\) provides project-based awards for Oklahoma nonprofits, educational institutions, and enterprises to pursue “applied research activities” whose results have “a high probability of leading to commercially successful products and processes or services within a reasonable period of time and a significant potential for stimulating economic growth within the State of Oklahoma[.]”\(^{150}\) OARS winners, as well as other Oklahoma-based enterprises, can also apply for a variety of financing programs, such as the Oklahoma Seed Capital Revolving Fund, to help them commercialize the results of

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\(^{142}\) See Iowa Admin. Code § 261 –108.2(15), 105.6(15) (location in Iowa required).

See also IEDA website: http://www.iowaeconomicdevelopment.com/Entrepreneurial/SSBCIInovation

\(^{143}\) Indiana Code § 5-28-16-2(a); EIGHTH REPORT TO THE INDIANA GENERAL ASSEMBLY: 21ST CENTURY RESEARCH AND TECHNOLOGY FUND, Indiana Economic Development Corporation, at 4.

\(^{144}\) As of April 2011 the Fund has been managed by Elevate Ventures, an Indiana nonprofit corporation, under contract with the Indiana Economic Development Corporation and the State of Indiana. See 21st Century fund website: http://www.21fund.org/ See also Indiana Code § 5-28-16.


\(^{146}\) Ky. Stat. § 164.6021(2)(a)- (b).

\(^{147}\) Ky. Stat. § 164.6021(3)(a), (d).

\(^{148}\) Ky. Stat. § 164.6037(2)(c).

\(^{149}\) OCAST is an instrumentality of the state. Okla. Stat. § 74-5060.2.B.

their research. The Fund is administered by OCAST and the OTCC, which contracts out management of state money to a nonprofit called “i2E” (“investment to enterprise”). The Fund authorizes loans, convertible loans and equity investments for high-tech enterprises engaged in “new product or process innovations” that have, among other things, “a reasonable chance of success” and “reasonable potential to enhance employment opportunities within the state.”

Texas Emerging Technology Fund (TETF). Texas’ TETF, administered by the Texas Emerging Technology Advisory Committee, provides Commercialization Awards in the form of equity investments for private or nonprofit enterprises working on developing “emerging technology projects with a demonstrable economic benefit to the state.” To be eligible for ETF commercialization awards, enterprises must collaborate with a state research institution or private institution of education in the state and must “guarantee by contract that a substantial percentage of any new or expanded commercialization or manufacturing resulting from the award will be established in this state.”

3. Other Types of State Commercialization Incentives

Importantly, state commercialization awards are administered under a backdrop of other incentives, such as state R&D tax credits, that are intended to encourage businesses to locate in the state. Also, states’ efforts are not limited to financing. States offer a variety of guidance and networking programs to help small businesses get information and access to private sources of capital. For instance, Oklahoma’s Technology Commercialization Center provides commercialization services for Oklahoma companies, including technology

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151 See Okla. Stat. § 74.5060.21 (authorizing Seed-Capital Revolving Fund).
152 See also i2E website: http://www.i2e.org/about/ See also OCAST website: http://www.ok.gov/ocast/Programs/Oklahoma_Seed_Capital_Fund_(OSCF)/ As mentioned above, I met with i2E directors at their Oklahoma City offices in Oklahoma to learn about these programs. Interview with Casey Harness, External Relations Coordinator, Director of the i2E Fellows Program. OCAST website: http://www.ok.gov/ocast/Programs/Oklahoma_Seed_Capital_Fund_(OSCF)/
154 The Committee is composed of 17 members appointed by the governor, the lieutenant governor, the speaker of the house of representatives and selected “industry leaders.” See Tex. Gov. Code 490.051-052.
155 Tex. Gov. Code 490.001(4) (equity awards); 490.151 (describing Incentives for Commercialization Activities). See also description of Commercialization Awards on the Governor’s website, http://governor.state.tx.us/ecodev/etf/etf_commercialization_awards
156 Tex. Gov. Code 490.151 (eligibility limited to collaborations); 490.155 (contractual guarantee of operation in Texas).
158 Berglund & Coburn, supra, at 27-9 (discussing start-up assistance and incubators), 29-31 (discussing state networking programs). On state programs to improve companies’ access to venture capital, see also Brian Krumm, State Legislative Efforts to Improve Access to Venture Capital, in ENTREPRENEURSHIP AND INNOVATION IN EVOLVING ECONOMIES: THE ROLE OF LAW (2012). See also Schoenberger, supra, at R3 (discussing some current state commercialization centers).
assessment, business model evaluation, and help in locating private investors. Oklahoma’s Department of Commerce also operates an Inventor’s Assistance program, which provides patent searches, business counseling, help obtaining financing, and “any other assistance necessary to develop the product to the commercial stage.” The program is only available for selected inventors who already have provisional patents or who have patent applications on file with the U.S.P.T.O.

4. Case Study of a State Commercialization Award

This case study is based on an interview with a faculty entrepreneur at the Yale School of Medicine, whom I will refer to by the pseudonym Bruce. Although I do not argue that this case study represents a statistically significant average, it illustrates how commercialization awards operate in practice and provides at least some empirical substance to the points I made above about the comparative efficacy of the federal and state financing programs.

Bruce is a research scientist in psychiatry at Yale. Around ten years ago, he developed a computer-based brain training program for harnessing neuroplasticity and improving cognitive function, with potential uses for schizophrenia treatment. Yale declined to invest in the program. Bruce began consulting for a company in California, which obtained patents on the invention. However, the company decided to develop another product and shelved development of Bruce’s schizophrenia program. He and another employee started their own company to develop their model. But their employer would not license them the IP, even though it was not planning to develop their model. The company did, however, give him rights to do non-commercial research.

Once he got back to Yale, Bruce started work on a second-generation model with improved functionality and focused on applying his program to treatment of cognitive dysfunction in children. While there, he partnered with a Chinese colleague and formed a company in Connecticut. They revised the invention to include both a neuroplasticity-harnessing computer-based program and a physical exercise regime. Through Yale, they filed for patents, which are still pending. Around the same time, Bruce and his partner began to raise money from angel investors including friends, family and neighbors. The angels were interested in the fact that they had patents pending and invested around $600,000 in exchange for equity. Yale also began arranging for presentations with larger investors. Yale helped them get a professional CEO willing to work in exchange for equity, who invested his own $50,000.

Yale also arranged a presentation for Connecticut Innovations (CI), a state owned corporation with the authority to invest in companies in various stages of development,

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159 The OTCC is administered by OCAST and the private nonprofit “i2E,” discussed below. See also OTCC website: https://www.ok.gov/ocast/Programs/Oklahoma_Technology_Commercialization_Center_%28OTCC%29/
161 Okla. Stat. § 74-5064.4(B)(2).
162 Interview with Research Scientist at the Yale School of Medicine, in New Haven, Conn. (October 26, 2013).
163 On the utility of case studies for discussing the efficacy of innovation incentives such as patents, see Kristen Osenga, Formerly Manufacturing Entities (working paper 2014).
164 Yale will keep all rights to the invention but will freely license the patents to Bruce's company so long as they pay back the costs of the patent application. They will also receive a percentage of sales royalties, to diminish over the lifetime of the patents.
COMMERCIALIZATION AWARDS

created by the Connecticut legislature in 1989 to provide venture capital to local entrepreneurs. CI reviewed Bruce and his partner’s proposal, focusing on technical merit as well as commercial merit, including product features, projected market, and key personnel. CI agreed to give them a $350,000 loan. “This was critical,” Bruce says. “It was the biggest single investment we got up to that point.”

After they got the CI award they also learned that they had received a highly competitive research grant, an NIH “Director’s Award” of $5 million, which they had applied for through Yale. The NIH award was only given to 3% of applicants. Their anonymous expert reviewer determined that theirs was the “most sophisticated brain training program ever conceived.” However, Bruce’s company cannot use the NIH award for its commercialization needs. They get around $40,000-$50,000 a year to support clinical trials at Yale, and the rest goes to the university and overhead expenses. Thus, they still need to raise significant amounts of capital to fund operations and begin product sales.

Bruce says he considered applying for an SBIR grant to get the commercialization funding they needed. But he rejected this option – even though NIH had an SBIR solicitation that was specifically related to brain training for children via video games. His main reasons for rejecting the SBIR route were that he didn’t like the idea of directing his research towards child video games and “the SBIR grant was small, and it would take too long to get the money.”

Instead, even after they got the NIH grant, Bruce and his partner continued to rely on angels and on CI, which chose to convert its loan into equity and gave around $150,000 more in operating capital. Bruce’s company has now started selling a version of the product to children in various states, including Virginia, Alaska and California. Over 3000 children are using it. They have not yet broken even but expect to do so in a few years. They currently have five employees, including the CEO and Bruce, who is part-time. Four are located in New Haven, where the company has its principal place of business. They see the company expanding locally in the future. They have also added one employee in Florida, where they recently contracted with a small company to do their marketing. They are currently seeking a third round of financing from CI, hoping to get $2 million plus. They want to make sure not to dilute their shares, but also want to make sure they have enough to cover their operating expenses and keep marketing and sales going.

III. Comparative Analysis of Commercialization Awards Versus Patents

As explained in Part I, patent law scholars have recommended introducing patent-based incentives to promote commercialization, including traditional patents that cover known products that have not been effectively commercialized, and an entirely separate form of commercialization patent, which would provide short terms of exclusivity for “substantially novel” products whose underlying inventions have not been commercialized.


166 Patents were less important to CI than other signs of technical and commercial merit.

167 See Duffy & Abramowicz, supra, at 405 (patents for known products or “smallish variations” of known product).
within three years of patenting. In Part II, however, I showed that federal and state governments already employ a variety of direct financing programs designed to increase and accelerate the pace of commercialization of technological research.

In this part, I compare newly proposed commercialization patents to existing commercialization awards based on the metrics that economists and legal scholars use to compare patents on new inventions to grants, prizes, and R&D tax credits. I focus primarily on state commercialization awards but also highlight important differences between federal and state strategies.

A. Engineering A Commercialization Imperative

As discussed in Part I.A., patents are thought to be a particularly effective way for government to promote innovation in part because patents automatically give owners supranormal incentives to patent and market their inventions prior to expiration of their patents without requiring the government to predict and value new inventions. However, in this section I show that commercialization awards, at both the federal and local levels, can also generate strong incentives to commercialize awarded inventions as vigorously and as rapidly as possible. They do this by adopting several important design features.

At the most basic level, commercialization awards are limited to applied research that has “a clear potential to lead to commercially viable products or services within a reasonable period of time.” For instance, Oklahoma’s Science and Technology Research and Development Council’s Innovation and Technology Commercialization Program grants are given to projects that “have a high probability of leading to commercially successful products and processes or services within a reasonable period of time.”

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168 Sichelman, supra, at 346 (proposing commercialization patents for “the same types of product inventions as those within the scope of traditionally patentable subject matter” for “substantially novel” products that are not yet commercialized.)

169 I refer to the patent-based proposals collectively as commercialization patents without restricting the term specifically to Sichelman’s proposal except where noted.

170 Again, I define commercialization awards as government-sponsored cash grants, loans, or equity investments with the express purpose of increasing and accelerating commercialization of applied science and technology-based research in the jurisdiction.

171 See, e.g., Nancy Gallini & Suzanne Scotchmer, Intellectual Property: When Is It the Best Incentive System?, in Innovation Policy and the Economy 51, 70 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2002) (“IP is probably the best mechanism for screening projects when value and cost are not observable by the sponsor, since the private value of IP reflects the social value, and firms automatically compare some measure of value to the cost of innovation. In addition, IP encourages firms to accelerate progress, since the reward is conditional on success.”) See also citations in note 187, infra.

172 Other scholars have noted that awards can be designed to share some of the virtues of patents. See, e.g., Abramowicz, Perfecting Patent Prizes, supra, at 176-81 (noting that appropriately designed prize systems, such as ones that link the reward to market sales, could overcome objections that rewards cannot provide sufficient incentive to commercialize); Hemel & Ouellette, supra, at 334 (noting that an advantage of “ex post” incentives like patents and prizes is that “money changes hands only after a successful product is developed—thus giving researchers strong incentives to self-select projects with the best prospects for success as useable products.”)

173 See, e.g., Iowa Admin. Code § 261-105.2 (15) (providing financing for “high-technology prototype and concept development activities that have a clear potential to lead to commercially viable products or services within a reasonable period of time[.]”), 261-108.8-9 (considering various factors relevant to assessing commercialization potential, including estimated time to completion); Ky. Stat. § 164.6021(2) (“support[ing] feasibility, concept development, research and development, or commercialization activities that have clear potential to lead to commercially successful products, processes, or services within a reasonable period of time”); Okla. Admin. Code 650:10-1-1 (providing funding for research whose results have “a high probability of leading to commercially successful products and processes or services within a reasonable period of time”); Wis. Stat. 560.275 (stating that criteria for federal matching
Development Act expressly conditions any financial assistance for technology development on an assurance that research results will have commercial application or at least that a “legitimate effort” be made to apply research “in a manner that has a reasonable potential to create or enhance employment or other factors contributing to economic growth in Oklahoma.” 175 Typical review criteria include a credible business plan, estimated time to completion, prior secured investments, and a plan for obtaining further financing. 176 As discussed above, Phase I SBIR awards also theoretically limit funding to “ideas that appear to have commercial promise,” 177 and Phase II awards are granted based on awardees’ “record of commercializing SBIR or other research.” 178

In addition, both state and federal awards are granted in stages, with additional financial support depending on commercialization success, 179 a strategy sometimes called staged financing. 180 States monitor commercialization success by imposing post-award reporting requirements and annual performance reviews. 181 Performance reviews, which may be performed by a state agency or a private company, typically include information such as awardees’ identities; area of research; state investment amounts; annual revenues subsequent to the awards; and number of employees generated and the industries in which they are employed. 182 In contrast, as discussed in detail in Part II.A., federal agencies, while

175 Okla. Stat. 74-5060.10. See also Okla. Stat. 74-5060.4.3 (defining “applied research” for purposes of research and commercialization funding as research by universities, nonprofits, and private enterprises in Oklahoma with “potential commercial application.”)

176 Iowa Admin. Code § 261-108.8-9 (1)-(7) (describing application selection criteria). See also Iowa Demonstration Fund Application.

177 15 U.S.C. § 638(e)(4), (5) (authorizing federal agencies to award first phase SBIR/STTR awards to small businesses after “determining, in so far as possible, the scientific and technical merit and feasibility of ideas that appear to have commercial potential...”)


179 As discussed in Part II.A., infra, SBIR/STTR awards come in phases. U.S. states frequently rely on staged financing models, giving out money in distinct installments depending on what stage of development the company reaches. For instance, Iowa’s Acceleration Fund, introduced above, provides company-based financing for Iowa-based companies or university researchers at three different stages of development: pre-seed stage (up to $100,000 or 50% of the project costs in low-interest loans; seed stage (up to $2,000,000 or 50% of the total project cost in low interest loans or royalty agreements); and expansion stage, where companies can receive a secured, low-interest loan of up to $2 million. See Iowa Admin. Code § 261-108. For more details see http://www.iowaeconomicdevelopment.com/Entrepreneurial/SSBCIInnovation

180 On VC’s use of staged financing as a performance incentive, see Gilson, supra, at 1079. See also Abramowicz, Perfecting Patent Prizes, supra, at 175 (noting that “it may be appropriate for rewards to be deferred until after there has been some time for commercialization.”)

181 For instance, Oklahoma’s Applied Research Program requires award recipients to “maintain records and accounts of that properly document and account for the source and application of all project funds” and to make all records available for inspection by OCAST. Okla. Admin. Code § 650-1-1-12(d). OCAST’s guidelines require principal investigators that are funded under the program to submit annual progress reports at specified periods and emphasizes that “[f]ailure to submit the annual report as required may result in a gap in funding or loss of funds.” OCAST, OKLAHOMA APPLIED RESEARCH SUPPORT PROGRAM (OARS), PROGRESS REPORT / PERFORMANCE EVALUATION, INSTRUCTIONS TO PRINCIPAL INVESTIGATORS. See also Iowa Admin. Code § 261-105.10(3) (“An applicant shall submit any information required by the [Economic Development Authority] in sufficient detail to permit the authority to prepare any reports required by the authority, the board, the general assembly or the governor’s office.”)

182 See, e.g., THE ECONOMIC AND FISCAL IMPACT OF THE DEMONSTRATION FUND ON THE IOWA STATE ECONOMY, by Econsult Solutions (February 20, 1013); EIGHTH REPORT TO THE INDIANA GENERAL
theoretically obligated to track SBIR commercialization efforts, do not uniformly enforce these requirements and face significant challenges in monitoring commercialization progress.

A final strategy used to incent rapid commercialization of research is to encourage award recipients to obtain patents and retain ownership to their patents and IP. Some states give more weight to research that is patented. The SBIR program also generally encourages participants to retain control of their IP. I discuss this strategy further in the next section.

B. Drawing on Private Information to Evaluate Inventions’ Commercial Potential

In the usual scholarly debates over prizes versus patents, an admitted downside to cash prizes for good inventions is that they are generally not linked to the prize winner’s ultimate market success. But as just explained, by conditioning commercialization financing on progressive showings of commercial success and, in some cases, by encouraging retention of patents on underlying inventions, commercialization awards also create stronger incentives to commercialize, and to do so rapidly, than would otherwise exist.

However, showing that commercialization awards, like patents, can be designed to create an imperative to commercialize is not sufficient. The main reason patents are said to be superior to direct financing of innovations is that patents rely on decentralized private actors rather than the government to identify and value (i.e. price) promising inventions for generation and development. In a footnote to his article proposing commercialization

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For example, Iowa’s Demonstration Fund emphasizes that “more points are awarded for greater IP control by the business, with the greatest number of points being awarded for exclusive IP ownership by the business.” See Iowa Admin. Code § 261-105.9(15)(1).

See Eisenberg, Public Research, surpa, at 1674-75 (explaining the theory behind the federal policy of encouraging government contractors to retain IP ownership). On SBIR’s approach to retention of IP and government march-in rights, see also Jeff Viano, Idaho Research and Development Funding: Stimulating Demand for Intellectual Property Professionals, 49 JUL Advocate (Idaho) 22 (2006).

Note that commercialization awards do not implicate the usual objection to encouraging patenting of government-funded research: that this “seems to require the public to pay twice for the same invention – once through taxes to support the research that yielded the invention, and then again through higher monopoly prices and restricted supply when the invention reaches the market.” Eisenberg, Public Research, supra, at 1666. The reason is that, assuming a clear divide between invention and commercialization is possible, underlying patents reward/incent invention, while the commercialization awards reward/incent commercialization of those inventions.

As Adam Smith described this virtue of patents:

if the legislature should appoint pecuniary rewards for the inventors of new machines, etc., they would hardly be so precisely proportioned to the merit of the invention as this is. For here, if the invention be good and such as is profitable to mankind, he will probably make a fortune by it; but if it be of no value he also will reap no benefit.

ADAM SMITH, Lectures on Jurisprudence 82-83, quoted in MERGES & DUFFY, supra, at 7, n. 20. See also Gallini & Scotchmer, supra, at 70 (concluding that IP is preferable when the value of the invention is not observable to government sponsors); Scotchmer, INNOVATION AND INCENTIVES, supra, at 85 (“A virtue of IP as an incentive mechanism is that it decentralized decision making”); Kieff, supra, at 713 (arguing that cash rewards rely on the assumption that the government has better information concerning ultimate market demand for a product); Abramowicz, Perfecting Patent Prizes, supra, at 194-95 (discussing the risk that prizes might
patents, Sichelman flags this problem as a reason to reject using grants instead of patents to promote commercialization. According to Sichelman, grants would likely be an ineffective mechanism for selecting and valuing inventions suitable for commercialization due to the government’s inefficacy at “picking commercially viable projects.”188 If the government directly financed commercialization of inventions, it would be likely to lose taxpayers’ money on bad investments, “particularly when firms are not required to pay back the funds in the event of failure.”189

I generally agree with literature suggesting that “government-set” rewards are likely to be inefficient when government cannot “foresee a potential invention or evaluate its costs and benefits.”190 However, in this section I show that this objection does not have as much salience when discussing financial awards for inventions that have already entered the commercialization phase or at least ESTD.191 I do not intend to suggest that government will do better than private markets at evaluating inventions’ commercial promise or that government picking lemons is not a risk.192 I simply suggest that, to the extent reliance on decentralized information and decision-making is a virtue of patents, commercialization awards can also have this virtue – particularly when granted by decentralized funding bodies at the local level.

Private Investors. At various stages in the funding process, states draw on the information and decisions of private investors, such as angel investors and venture capitalists (VCs), by requiring co-investment from private sources.193 In some cases, states require

be paid to inventors with “commercially unattractive inventions” due to the problem of asymmetric information between private inventors and prize administrators; Kapczynski, supra, at 977-79 (responding to the argument that IP is worth associated costs like deadweight loss due to its efficacy at “pricing” information goods); Hemel & Ouellette, supra, at 327 (“Government-set rewards are inefficient when the government cannot foresee a potential invention or evaluate its costs and benefits; the government might vastly undervalue the invention (causing innovators to not pursue the project despite its social value) or overvalue the invention (diverting innovators’ attention from more useful endeavors.).”); Sarnoff, supra, at 1101-1102 (discussing Brett Frischmann’s view that tax should be preferred for commercial projects because they leave selection of inputs and outputs to firms, which are the “best informed investor[s]” of the resources); Kapczynski & Sayed, supra, at 1912, n. 38 (2013) (“leading accounts of the comparative institutional benefits of patents versus financial prizes and government funding emphasize that patents’ key advantage as a method of stimulating innovation is their superior ability to make use of private information about the value of prospective inventions.”)

188 Sichelman cites an empirical study by economist Roger Svensson, which, in Sichelman’s words, “found that government funding can decrease the likelihood of commercialization, particularly when firms are not required to pay back the funds in the event of failure and the government is not adept at picking commercially viable projects.” Sichelman at 394, n. 319 (citing Roger Svensson, “Commercialization of patents and external financing during the R&D phase,” Research Policy, Elsevier, vol. 36(7), pages 1052-1069, September 2007.) Svensson’s study was on Swedish patents, and it explicitly contrasted the seemingly ineffective Swedish model to the United States, which has more small firms and more private investment capital. Svensson at 1 The study’s suggested reasons for bad performance were the design of the government loans, which allowed the patent owner to avoid paying the loans back even if the project failed, and the competence of the government institutions providing the funding, which, according to Svensson, are poor “venture capital firms.” Id., Abstract. I discuss the problem of government inadequacy at picking winners in the next section.

189 Sichelman, supra, at 394, n. 319.

190 Hemel & Ouellette, supra, at 327. See also citations in note 187, supra.

191 See discussion of these phases of innovation in Part I.C.

192 For a critique of state government’s ability to perform effective VC financing, see Ibrahim, supra, at 736-37 (nonetheless stating that state programs that require private matching funds may do a better job).

193 On VC investing, see Gilson, supra, at 1070-76. On angel investors, see Ibrahim, supra, at 748-53. Importantly, VC’s are often more interested in companies in the later stages of development. See id. at 733-35. See also Gilson, supra, at 1074-75 (describing VC’s preference to companies likely to have an IPO or be bought out in the near future).
applicants to obtain private financing first, before they can receive any state assistance at all.194 This makes sense: states would prefer not to be the first investor in a technological venture of unproven viability. However, given the purpose of commercialization awards to correct market failures, states do not often have this luxury and may find themselves doing the first due diligence on new and unproven companies.195

To reduce the risk of investing without limiting investment to companies that have already received significant third-party financing, states require prospective awardees to secure simultaneous co-investment before they will close a funding contract. For instance, Iowa’s Demonstration Fund and Oklahoma’s Applied Research Support (OARS) fund both require securing one to one matching from non-state sources to obtain funding for a project.196 Likewise, the Oklahoma Seed Capital Fund requires all investments to have one to one capital co-investment, whether from VCs or angels, before the state will close a deal.197 This is sometimes called matching or leveraging.198 In contrast, federal SBIR awards do not generally require matching from non-government sources in order to obtain a first round of funding.199

**Certification by other levels of government.** Along with private investors, commercialization award administrators may also rely on information imparted by other levels of government, providing more funding to companies that have already been awarded by other governmental bodies. This is sometimes called a certification effect.200 The most obvious example is when state governments offer matching awards or bridge financing for winners of federal SBIR awards. As David Ross puts it, by granting SBIR derivatives, “[a] state or

194 For instance, Wisconsin’s Technology Commercialization Grant and Loan program, discussed above, has a fund that provides grants and loans only to those who have already received some third party financing and are waiting on more. Wis. Stat. 560.275(2)(c). To be eligible for any form of Wisconsin financing (with the exception of SBIR/STTR derivative awards), an enterprise must be “starting or developing a business which has significant growth potential, as evidenced by the potential to attract and receive early stage financing from 3rd parties, but who needs assistance [from the state] with a specific facet of starting or developing the business.” Wis. Stat. 560.275(5)(a)(2) (emphasis added).

195 According to Casey Harness at i2E “in a perfect world, we [i.e. Oklahoma] would not be doing the first diligence on these projects. But this is usually not the case.”

196 See Iowa Admin. Code § 261–105.5(15) (“In order to receive financial assistance, an applicant must demonstrate the ability to secure one dollar of nonstate moneys for every two dollars received from the authority). On OARS, see Okla. Admin. Code 650:10-1-1 (requiring at least 50% of direct project cost to be provided by sources other than the state).

197 Okla. Stat. § 74.5060.21.F2.c,d (stating that to provide financing from the fund, OCAST must find, among other things, that OCAST’s “participation is instrumental to the success of the enterprise and will assist in its retention within the state,” and that OCAST’s “investment is leveraged by at least one additional equity or near-equity investor[].”

198 Even when matching is not a statutory requirement, states make the potential to obtain non-state financing a basic criteria for investment. For example, Texas’ ETF does not explicitly require private sector matching, but the ETF application requires itemizing all funding sought from the state, along with a “breakdown of other funding [the applicant is] seeking in parallel with the ETF award.” Texas ETF Commercialization Award Application, at 6, available here: http://governor.state.tx.us/ecd/etf/app/apply_commercialization

199 Phase II, but not Phase I, awards consider “the existence of second phase funding commitments from private sector or non-SBIR funding sources,” among other things, as evidence of the proposal’s commercial merit. 15 U.S.C § 638(e)(4)(B)(ii). See also Viano, supra, at 22 (noting that SBIR awards require no matching funds). Also, as stated above, Phase III must be financed by non-SBIR/STTR sources, though this can mean federal procurement contracts. Id. at § 638(e)(4)(C) (SBIR), § 638 (e)(6)(C) (STTR).

200 Josh Lerner has shown that winning federal SBIR awards can create a “certification effect,” enhancing the award winner’s potential for getting follow on funding. Lerner, The Government as Venture Capitalist: The Long Run Impact of the SBIR Program, supra, at 285.
local government may freely leverage the best ideas from the smartest and strongest firms by
lavishing rich incentives only upon those applicants who actually receive an SBIR award.201
Indeed, states can potentially be guided by any type of federal research award.202 For instance,
in the case of one faculty entrepreneur I interviewed, Connecticut Innovations decided to
make a second round of financing in Bruce’s company due in large part to his success in
winning the prestigious NIH award and the NIH expert reviewer’s favorable assessment of
their technology.203

Patents. Commercialization patents, at least in Sichelman’s iteration, build on
information contained in U.S. patents, since only previously patented inventions are eligible
for commercialization patents.204 Thus, only inventions that have been properly “screened”
by the patent granting process would benefit from this additional market protection.205

However, commercialization award administrators can and sometimes do privilege
patented inventions in deciding where to invest, relying on patents as proxies for the
technical if not the commercial merit of an invention206 or as deliverers of technical
information regarding an invention.207 Commercialization award applications typically require
itemizing all patents and IP that the company has obtained or plans to obtain.208 And at least
some states give extra weight to ownership of patents and other IP.209 Federal agencies
participating in SBIR also require identification of relevant IP in proposals.210 Thus, to

201 See Ross, supra, at 121. As discussed below, there is a political accountability problem present with state
derivatives: when a project fails, the state can blame federal agencies; when it succeeds, the state in which the
company locates reaps the economic benefits.
202 For instance, Wisconsin’s Technology Commercialization Grant and Loan program, discussed above,
provides grants and loans to those who have applied for or received “a grant from the federal government for a
substantially similar purpose.” Wis. Stat. 560.275(2)(a), (b).
203 Interview with Research Scientist at the Yale School of Medicine, in New Haven, Conn. (October 26, 2013).
204 See Sichelman, supra, at 346 (commercialization patents can only be obtained for previously patented
inventions.)
205 For the argument that the patent system is more effective than governments at “screening” inventions for
qualifying criteria of novelty, nonobviousness and utility, see Kieff, supra, at 712-14.
206 Long, supra, at 653. This hypothesis was to some extent supported by the recent Berkeley Law
trepreneurship survey regarding the role of patents in obtaining private capital. See Stuart Graham, Robert
Merges, Pamela Samuelson, & Ted Sichelman, HIGH TECHNOLOGY ENTREPRENEURS AND THE PATENT
(summarizing results of surveys of high tech start-up executives revealing their view that patents are perceived as
important to investors, especially in biotech, and may help in obtaining funding). On patent disclosures,
207 On the debateable utility of patent disclosures in imparting useful technical information, see Do Patents
Disclose Useful Information?, supra, at 545-48.
208 For instance, Iowa’s Demonstration Fund has a full section devoted to information regarding IP ownership,
asking whether the technology to be developed involves “patentable products/processes or [IP] that can be
protected through copyright or other legal means[,]” and whether any patents have yet been filed, who owns
the patents, and whether a valuation of the patent has been done. See Iowa Demonstration Fund Application,
at 8-9, available at http://www.iowaeconomicdevelopment.com/Entrepreneurial/DemoFund See also, e.g.,
Texas ETF Commercialization Award Application, at 7 (“List any issued or pending IP including dates,
numbers and descriptions, including patents, trademarks, copyrights and trade secrets”), available at:
http://governor.state.tx.us/economicdev/etf/apply_commercialization
209 For example, according to an employee at i2E in Oklahoma, which has a contract to invest state money in
high-tech enterprises that agree to locate in the state, although the state is "agnostic" regarding which type of
technology the enterprise is developing, "ownership of patents and IP, or an exclusive license to use others' IP,
is very important in deciding whether to help a company with commercialization. Interview with Casey
Harness, December 20, 2013.
210 The National Institute for Standards in Technology in the Department of Commerce, for instance asks that
all IP be noted on a single page in the proposal and labeled as confidential and proprietary. See SBIR/STTR
varying degrees, commercialization award administrators build on the ex ante screening performed by the patent application and granting process.\footnote{211}

C. Comparative Downsides of Commercialization Awards

Above I showed that commercialization awards, like proposed commercialization patents, can be designed to incent more vigorous and rapid commercialization than would otherwise occur and also rely on decentralized sources of information and decision-making. At the same time, awards avoid imposing the most oft-discussed social costs of exclusive rights: deadweight loss, where some consumers are priced out of patented products or services due to patent holders’ ability to charge above marginal cost,\footnote{212} concentration of market power,\footnote{213} reduced incentives to innovate in the same field,\footnote{214} and “thickets” of rights that cannot necessarily be transacted around.\footnote{215} Also, since awards are not necessarily restricted to patentable subject matter, they provide a means for the government to subsidize socially valuable innovations for which the promise of exclusive rights provides weak or no incentives.\footnote{216}

Yet commercialization awards also have significant downsides that must be addressed in deciding whether to introduce commercialization patents as supplements or alternatives. I discuss three downsides below.

1. Government as Venture Capitalist

The main downside of commercialization awards, which I’ve already alluded to, is that they rely to some degree on direct government administration.\footnote{217} Like any legislative alternative to a patent system that gives government significant discretion, commercialization

\footnote{211}{See Kieff, supra, at 712-14.}
\footnote{212}{See Kapczynski, supra, at 974. \textit{See also} Scotchmer, \textit{Innovation and Incentives}, supra, at 36-37 (noting that deadweight loss is the main defect of IP as an incentive mechanism but that it can potentially be mitigated by perfect price discrimination, where patent holders charge each consumer their willingness to pay ).}
\footnote{213}{See Herbert Hovenkamp, \textit{Competition for Innovation}, 2012 \textit{Col. Bus. L. Rev.} 799, 805-808 (2012) (discussing debates over whether monopolists or smaller rivals are more likely innovators).}
\footnote{214}{Scotchmer, \textit{Standing on the Shoulders of Giants: Cumulative Research and the Patent Law}, 5 \textit{J. Econ. Persp.} 29, 32 (1991) (posing that second generation innovators’ incentives to develop second generation products can be too weak due to weak bargaining positions in patent licensing).}
\footnote{216}{See Kapczynski & Sayed, supra, at 1905 (arguing that patents systematically underreward certain research that yields less than full appropriability). \textit{See also} Peter Lee, \textit{Social Innovation} (working paper 2014) (arguing that patents alone are not sufficient to incent generation of certain socially valuable innovations.)}
\footnote{217}{See Sichelman, supra, at 394, n. 319 (mentioning downsides of government providing funds to private firms to promote commercialization). See also, e.g., Abramowicz, \textit{Perfecting Patent Prizes}, supra, at 180-81 (on difficulty of government screening for new inventions and evaluating commercial considerations like sales data and consumer demand).}
awards are vulnerable to political influence. This can include simple political corruption. For instance, Texas’ Emerging Technology Fund (ETF), described in Part II.B., was accused of giving away money to Governor Rick Perry’s friends and campaign donors. But even assuming government officials are not corrupt, government may simply be an incurably poor venture capitalist. In his recent article describing various financing options or entrepreneurs in high tech regions like Silicon Valley, David Ibrahim concluded as much, writing that when a state acts as “a direct investor in start-ups,” it is likely to lack “the relevant expertise or market incentives for investment.” Ibrahim flags a variety of reasons for this. One is the risk of under-compensated and unskilled government officials. The other is the risk that political economic interests will interfere with true innovation. “State VCs,” he concludes, “may have more incentive to select start-ups for political reasons, including immediate if unsustainable job creation.”

This tension between officials’ desire to produce short-term political gains and long-term economic growth is codified in the structure of many of the state programs discussed above. For example, Indiana’s Twenty-First Century Technology Fund requires submitting a statement of the “economic development potential of the project,” including a projection of jobs to be created. Kentucky’s SBIR matching program selects awardees based not just on technical and commercial merit, but also on the “projected economic impact in Kentucky,” including the type and number of jobs to be created. In theory, such approaches could lead to awards for complex inventions that use human labor to perform simple tasks that machines already do more productively.

The main potential solution to this problem, which Ibrahim also mentions, is to make awards contingent on obtaining private sector matching, and to make private investors, rather than government officials, play the primary role in approving and nurturing investments. As discussed above, most states already do this. One objection to the

218 See Kenneth W. Dam, The Economic Underpinnings of Patent Law, 23 J. LEGAL. STUD. 247, 248 (1994) (“there is reason indeed to believe that the patent law approach is preferable to a legislative approach that involved industry by industry subsidies or other market advantages, especially in view of the rent-seeking and pork barrel features of any legislative approach.”) See also Benjamin & Rai, supra, at 13-14 (arguing that innovation policy is slighted by ordinary political processes in part because small, entrepreneurial firms may have less power than incumbents to influence regulatory decisions.)


220 Ibrahim, supra, at 736, 736-39 (drawing on Ronald Gilson’s notion of the proper financial intermediary.)

221 Id. at 737. See also Benjamin & Rai, supra, at 13 (arguing that another reason innovation policy may suffer when directed by government actors is that they “have very little incentive to force themselves to think about long-term outcomes, as they are unlikely to be around to reap credit (or blame).”) 222 Indiana Code 5-28-16-3(c)(3). See also Okla. Stat. §74.5060.21.F (awarding “new product or process innovations” that have, among other things, a “reasonable potential to enhance employment opportunities within the state[,]”); Tex. Gov. Code 490.151 (awarding “emerging technology projects” that are expected to provide “a demonstrable economic benefit to this state.”)

223 Kentucky SBIR/STTR Matching Funds Program Solicitation Notice (July 2, 2013), at 14, 21

224 On machines being increasingly used to perform tasks once done by humans, see Erik Brynjolfsson & Andrew McAfee, RACE AGAINST THE MACHINE (2011).

225 See Ibrahim, supra, at 737-38 (“The better alternative [to states being the sole investor] is for states to provide matching funds to private VCs. In other words, this is a private VC solution with states supplying the
matching requirement is that this may require entrepreneurs to give up too much leverage with investors and reduce the value of government intervention in the first place.\textsuperscript{226} In theory, commercialization patents would serve as a “signal” that enhances entrepreneurs’ chances of getting funding without giving up significant amounts of equity.\textsuperscript{227} Meanwhile, holders of commercialization awards that provide no exclusive rights and yet require matching of government money might be in a less favorable bargaining position when trying to secure capital.

However, research suggests that commercialization awards themselves can enhance entrepreneurs’ prospects of obtaining private financing by providing a government “certification” of the venture’s technical and commercial merit. In their recent study of Michigan’s Life Science Corridor (MLSC) program, Bo Zhao and Rosemarie Ziedonis found that state awards for technology startups increased companies’ chances of obtaining follow-on financing, particularly when the companies were relatively young and faced unusual difficulties in proving their worth to investors.\textsuperscript{228} Although no one has done as robust an empirical analysis, the Texas Emerging Technology Fund (ETF), described in Part I.B., may provide another example of this phenomenon: at least according to annual state reports, between 2005 and 2012 Texas gave $195 million in commercialization awards to 137 companies, which then went on to raise over $750 million from non-state sources.\textsuperscript{229}

The signaling function of commercialization awards means that companies will hopefully be able to access more money than what the state gives them, magnifying the power of the incentive in a similar way as patents are said to do.\textsuperscript{230} It also raises the possibility that commercialization awards allow the government to do something that commercialization patents would probably not: allow the government to inform private actors regarding the government’s assessment of a venture’s commercial and social value.

As discussed above, government is not believed to have significant informational advantages over private investors when it comes to evaluating ventures’ technological and commercial merit.\textsuperscript{231} However, Clayton Gillette has compellingly argued that local jurisdictions (if not federal agencies), can possess valuable information regarding a venture’s prospects in the jurisdiction that private investors lack, “either because the firm would be more productive in one location than another or because the firm produces spillover benefits within a jurisdiction that exceed the benefits that it would produce in other jurisdictions.”\textsuperscript{232}

Localities’ “inside information” can include information about natural resources, local risk capital instead of, or in addition to, the usual private VC fund investors.”). See also McGuire, supra, at 431-34 (discussing benefit of state funding that can be leveraged to obtain private sector funding.)

\textsuperscript{226} Thanks to Michael Risch for raising this point.

\textsuperscript{227} See Lemley, Reconcepting Patents in the Age of Venture Capital, 4 J. SMALL & EMERGING BUS. L. 137, 143-44 (2000) (arguing that with the rise of VCs investing patents were becoming increasingly important as financing tools, citing empirical showing correlation between patenting and venture capital financing.) See also Graham et al, supra, at 1300 (reporting results of survey suggesting that for entrepreneurs in various industries patents are seen as a means to secure financing and enhance reputation.) But see Ronald Mann, Do Patents Facilitate Financing in the Software Industry? 83 TEx. L. REV. 961, 976-77 (2005) (suggesting that in the software industry patents are not are not relied on to the same degree by investors).

\textsuperscript{228} See Zhao & Ziedonis, supra, at 18-22.

\textsuperscript{229} See ANNUAL REPORT TO THE TEXAS STATE LEGISLATURE ON THE TEXAS EMERGING TECHNOLOGY FUND (2012), available at: http://governor.state.tx.us/ecodev/etf/ I concede that there are plenty of reasons to doubt these numbers. See news reporting by Litman in note supra.

\textsuperscript{230} See Long, supra, at 647-68 (arguing that VC’s may look to patents as proxies for quality).

\textsuperscript{231} See Ibrahim, supra, at 736-37.

\textsuperscript{232} See Gillette, supra, at 458.
networks and human capital, or knowledge about local laws, regulations, or future development plans to which private firms lack access.\footnote{See Gillette, supra, at 461-62.}

When we combine empirical research showing that state awards are providing signals to investors and Gillette’s thesis that local business incentives can impart localized information to the private sector, commercialization awards could serve as “a solution to a problem of asymmetric information” in two distinct ways: by helping developers of unproven but potentially valuable new technology access private capital that would otherwise be out of reach,\footnote{See, e.g., Auerswald & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 1-4 (discussing necessity for government incentives during early stage technology development).} and by conveying new information to private investors regarding the value of the firm or project to the particular jurisdiction.\footnote{Gillette, supra, at 457.} This informational argument is probably the most compelling justification for state venture capital in support of high technology development. It is at the heart of current suggestions that regional governments can hope to engineer innovation “clusters” in their jurisdictions, resulting in more efficient allocation of resources towards certain innovation-intensive sectors than would occur organically in the absence of government incentives.\footnote{On cluster theory, see, e.g., Michael Porter, Clusters and the New Economics of Competition, Harvard Business Review (November-December 1998); Thomas Lyon & Russell Baruffi, Creating a Plug-In Electric Vehicle Industry Cluster in Michigan: Prospects and Policy Options, 18 MICH. TELECOMM. & TECH. L. REV. 303, 305-309 (2011). On the organic evolution of Silicon Valley, see Analee Saxenian, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128 4, 9, 34 (2d Ed. 2006).}

2. Less Efficient Allocation of Resources Towards Innovation?

As discussed in Part I.A., scholars such as Edmund Kitch assert that assigning exclusive rights to a single entity to develop certain technological prospects “assures efficient allocation of resources among the prospects at an efficient rate and in an efficient amount.”\footnote{Kitch, supra, at 266 (describing this theoretical virtue of patents.)} Because commercialization awards do not create exclusive rights in commercialization “prospects,” multiple award recipients would be free to commercialize the same inventions in multiple jurisdictions at the same time – potentially leading to wasteful duplication of effort.\footnote{Id. But see Merges & Nelson, at 873-74 (suggesting that allowing multiple entities to work on solving the same problem is preferable to centralized control.)} Even if we disagree that commercialization patents would perform this waste-reducing function any better,\footnote{See Duffy, Rethinking the Prospect Theory of Patents, supra, at 442 (noting that a major objection to prospect theory is that granting broad, early patents may not eliminate but “merely shift back in time” the race to derive a patentable invention.)} Duffy has argued that the race to obtain patents that will subsequently expire is socially beneficial because it accelerates the pace at which innovations enter the public domain.\footnote{Id. at 256-58.} As discussed above, commercialization awards also create incentives to commercialize inventions faster than would otherwise occur; yet it is not clear how much competition they generate to obtain awards absent any strict requirement that the innovation be novel for the government to invest in it.\footnote{See 35 U.S.C. § 102 (providing that, with certain exceptions for inventor disclosures made within a year before filing, no patent can be obtained for inventions that were previously patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the filing date of the claimed invention.)}

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\footnote{See Gillette, supra, at 461-62.}
\footnote{See, e.g., Auerswald & Branscomb, BETWEEN INVENTION AND INNOVATION, supra, at 1-4 (discussing necessity for government incentives during early stage technology development).}
\footnote{Gillette, supra, at 457.}
\footnote{Kitch, supra, at 266 (describing this theoretical virtue of patents.)}
\footnote{Id. But see Merges & Nelson, at 873-74 (suggesting that allowing multiple entities to work on solving the same problem is preferable to centralized control.)}
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\footnote{Id. at 256-58.}
\footnote{See 35 U.S.C. § 102 (providing that, with certain exceptions for inventor disclosures made within a year before filing, no patent can be obtained for inventions that were previously patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the filing date of the claimed invention.)}
possible that well-designed commercialization patents would be more efficient at channeling rivalry towards accelerating commercialization.\(^\text{242}\)

3. The Transactional Role of Property Rights

According to Kitch and patent law scholars like Robert Merges, one of the key features of patents is that, like other property rights, they facilitate the disclosure and transfer of information related to an innovation from those who generate it to those who can most efficiently develop and use it.\(^\text{243}\) A major way patents do this is by facilitating disclosure of information – including information contained in patent specifications as well as valuable information not contained in the patent – in formulating business deals involving this information.\(^\text{244}\) However, commercialization awards do not require standardized disclosures of information or create rights in that information. Thus, they lack this mechanism for transacting around information generated in the process of commercialization that is not protected by patents on the underlying inventions.\(^\text{245}\) Except in cases where government grants commercialization awards only for information that is fully codified in patents on underlying inventions, which is probably impossible,\(^\text{246}\) it may be difficult and financially unappealing for commercializers to disclose and sell to others information that they derive through the process of commercialization itself.\(^\text{247}\)

**CONCLUSION**

In order to have a useful debate over whether new forms of patents are needed to promote commercialization, existing commercialization incentives must be taken into account. In this Article, I have shown that the government already provides commercialization financing for inventors and entrepreneurs that cannot raise sufficient capital to cover early-stage technology development and survive into profitability. Although the federal SBIR program is theoretically intended to promote commercialization by requiring federal research agencies to reserve a small percentage of funding for research contracts with small businesses developing ideas with commercial potential, the program’s primary purpose is generation and disclosure of new information, not near-term commercialization. In contrast, U.S. states offer a variety of commercialization awards specifically designed to increase and accelerate the pace of commercialization in their jurisdictions. I further suggested that, even though they rely to some extent on the

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\(^{242}\) See Duffy, supra, at 491-509 (discussing design features of patents, such as a tight correlation between priority and expiration and relatively early granting, that might accelerate innovation.)

\(^{243}\) Merges, A Transactional View of Property Rights, supra, at 1481 (discussing Harold Demsetz, Toward a Theory of Property Rights, 57 AM. ECON. REV. 347, 351-53.) See also Kitch, supra, at 277 (“a patent system lowers the cost for the owner of technological information contracting with other firms possessing complimentary information and resources.”); Kieff, supra, at 703 (“the treatment of patents as property rights is necessary to facilitate investment in the complex, costly, and risky commercialization activities required to turn nascent inventions into new goods and services.”)

\(^{244}\) Merges, A Transactional View of Property Rights, supra, at 1500.

\(^{245}\) See Abramowicz & Duffy, supra, at 342, 405-407 (observing that, with some exceptions like business method patents, patents currently do not protect information related to market experimentation versus technological experimentation).

\(^{246}\) On tacit knowledge that cannot be codified in patents, see, e.g., Lee, supra, at 1503.

\(^{247}\) But see Burstein, supra, at 248-55 (challenging the assumption that information is inherently nonexcludable without patents.)
government to select and administer awards, commercialization awards mitigate the risks associated with government administration by adopting strategies, such as strict co-investment requirements and stages financing, that permit government to draw on private information regarding inventions’ commercial viability and reduce the risk of wasting public money on unproven technology-based ventures.

I conclude with one simple point: in light of the existence of commercialization awards at both the federal and state levels that may be as efficient or more efficient than proposed commercialization patents, it seems hasty and probably unwise to try to introduce new forms of exclusive rights, especially given empirical uncertainty regarding whether patents promote innovation and the current anti-patent climate.\textsuperscript{248} Importantly, although this Article casts significant doubt on the utility of new forms of IP for promoting commercialization, it does not address the larger question of whether U.S. patents for inventions are or should be designed to promote commercialization. In fact, as discussed in Part III, the commercialization awards discussed in this paper all generally encourage patenting of inventions produced during the innovative process. Thus, patents, as presently designed, may indeed be playing a crucial – albeit concurrent – role in encouraging faster and more vigorous commercialization of inventions than would otherwise occur.\textsuperscript{249} However, to the extent that scholars have proposed instituting wholly new forms of patents specifically to facilitate commercialization, we must pay careful attention to the significant role that federal and local governments are already playing before seriously considering these options.

\textsuperscript{248} See Ouellette, Patent Experimentalism, supra (on empirical uncertainties regarding whether patents promote innovation); Holte, supra (on anti-patent climate with respect to so-called patent trolls).

\textsuperscript{249} See, e.g., Kitch, supra, at 276-78.