CLUSTER COMPETITION

by
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There is fierce regional competition to grow "innovation clusters" in the United States. Many commentators worry that states and cities are overspending on innovation rather than focusing on more immediate problems like improving basic infrastructure. For the first time, the federal government is beginning to take action to reduce the costs of regional cluster competition through various national cluster programs run by agencies like the Economic Development Administration and the Small Business Administration. Drawing on patent law theory, I argue these programs represent an innovative way to "manage" local investments in innovation. Instead of granting regions exclusive rights over particular clusters, the federal government provides grants for regions that design and disclose winning cluster strategies. In theory, this encourages regions to specialize in areas where they have a real comparative advantage—such as efficient energy in Philadelphia, Pennsylvania or 3-D printing in Youngstown, Ohio—rather than wasting money in a race to be winners in the same technology fields. In addition, federal involvement may change the types of innovation in which regions invest, making "high-spillover" research that benefits other places more attractive through the promise of federal subsidy. Lastly, Congress has authorized creation of a new database containing information and analysis of regional cluster activity, to be shared with other state and local actors. Despite its advantages, this strategy also faces a serious challenge. As in patent law, where inventors may spend more on research due to the prospect of getting a patent, regions may engage in more rather than less wasteful spending on innovation due to the opportunity for federal grants. Therefore, I argue the "carrot" of federal subsidy should be accompanied by the "stick" of preemption in certain circumstances.

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INTRODUCTION

Governments across the globe have increasingly made it a core feature of their economic development policies to develop "innovation clusters": regional economies made up of firms, suppliers, and human talent whose core activity is innovation.[1] Interjurisdictional competition is nothing

[1] MARK MURO & BRUCE KATZ, BROOKINGS INST. METRO. POLICY PROGRAM, THE NEW 'CLUSTER MOMENT': HOW REGIONAL INNOVATION CLUSTERS CAN FOSTER THE NEXT ECONOMY 9, 10–11, 16 (2010) (adopting a similar definition); *see also* ROBERT D. ATKINSON & STEPHEN J. EZELL, INNOVATION ECONOMICS: THE RACE FOR GLOBAL ADVANTAGE 5 (2012); ANNALEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128 1–3 (2000). For an in-depth discussion of the theory behind innovation clusters and major examples of clusters, *see* Maryann Feldman, *The New Economics of Innovation, Spillovers and Agglomeration*, 8 ECON. INNOVATION & NEW TECH., 1999, at 5, 7 (discussing effects of proximity on innovation); Maryann Feldman & Pontus Braunerhjelm, *The Genesis of Industrial Clusters*, *in* CLUSTER GENESIS: TECHNOLOGY-BASED INDUSTRIAL DEVELOPMENT 1, 1–2

new.[2] But we are no longer in the "smokestack chasing" era, when cities in the Northeast and the Midwest competed fiercely to attract paper mills and automobile factories.[3] Instead of smokestack chasing, governments are "'innovation chasing,' trying to grow and attract the highest-value-added economic activity they can: the high-wage, knowledge-intensive manufacturing, research, software, information technology (IT), and services jobs that power today's global, innovation-based economy."[4]

Until recently, the U.S. federal government was "almost entirely absent from the realm of cluster initiative programs."[5] But this is changing. The National Academy of Sciences recently held two symposiums bringing together state and local officials to discuss strategies for growing clusters.[6] And Congress has adopted a number of innovation cluster initiatives operated through various agencies, such as the Small Business Administration (SBA), the Department of Energy (DOE), the National Institute of Standards & Technology (NIST), and the Economic Development Administration (EDA).[7] The most prominent example of the expanded federal role in cluster policy is the America COMPETES Act, which established a "regional innovation program" (RIP) "to encourage and support the development of regional innovation strategies, including regional innovation clusters . . . ."[8] The program's flagship ini-

(Pontus Braunerhjelm & Maryann Feldman eds., 2006); Michael Porter, *Clusters and the New Economics of Competition*, HARV. BUS. REV., Nov.–Dec. 1998, at 77, 78, (discussing the private benefits for participants in clusters); *see also* Gilles Duranton, *California Dreamin': The Feeble Case for Cluster Policies* 3 REV. ECON. ANALYSIS, 2011 3, 3–4 (discussing the economic justifications and major critiques of cluster theory).

[2] *See generally* Daphne A. Kenyon, *Theories of Interjurisdictional Competition*, NEW ENG. ECON. REV., Mar.–Apr. 1997.

[3] ATKINSON & EZELL, *supra* note 1, at 5.

[4] *Id.*

[5] KAREN G. MILLS, ELISABETH B. REYNOLDS & ANDREW REAMER, BROOKINGS INST. METRO. POLICY PROGRAM, CLUSTERS AND COMPETITIVENESS: A NEW FEDERAL ROLE FOR STIMULATING REGIONAL ECONOMIES 19 (2008) (suggesting the federal government should establish a "cluster initiative program," including a federal grants program to support regional and state initiatives); *see also* BRUCE KATZ & JENNIFER BRADLEY, THE METROPOLITAN REVOLUTION 206–07 (2013) (discussing the prominent role of cities in cluster strategies).

[6] *See* NAT'L RESEARCH COUNCIL, BEST PRACTICES IN STATE AND REGIONAL INNOVATION INITIATIVES 2 (2013) [hereinafter NRC Symposium]; NAT'L RESEARCH COUNCIL, GROWING INNOVATION CLUSTERS FOR AMERICAN PROSPERITY 36 (2011) [hereinafter NAS Symposium].

[7] NRC Symposium, *supra* note 6, at 14.

[8] 15 U.S.C. § 3722(a) (2012) (this and subsequent sections codified America COMPETES Reauthorization Act of 2010, Pub. L. No. 111-358, Title VI, § 603, 124 Stat. 3982, 4030–37). The Act also called for grants for science and research parks; that part of the program was repealed by Commerce, Justice, Science, and Related Agencies Appropriations Act, 2015, Pub. L. No. 111-235, Title VII, §705, 128 Stat. 2130, 2230–2234 (amending 15 U.S.C. § 3722) [hereinafter 2015 Appropriations].

tiative is a multi-agency competition that awards grants and matching funds for winning proposals from states and regional governments and other stakeholders to develop innovation clusters.[9]

The consensus among stakeholders—the Administration, federal agencies, state and local governments, university administrators, and think tanks like the Brookings Institute—is that not only is federal intervention necessary, but it should have happened sooner. "After a decade of delay," Mark Muro and Bruce Katz at the Brookings Institute write, "the executive branch and Congress have joined state and local policymakers in embracing 'regional innovation clusters' . . . as a new framework for structuring the nation's economic development activities."[10] However, the U.S. government's decision to fund a national cluster competition is curious in light of the fact that there is *already* intense competition to grow innovation clusters in the United States at the regional level. For decades, states, cities, and other subnational governments have put significant resources into programs to grow clusters: from spending on infrastructure; to investments in higher education and university research; to tax breaks, subsidies, and public venture capital for firms seeking to conduct or commercialize cutting-edge research.[11]

According to some theories of federalism, this should be the end of the story.[12] Decentralization of sovereignty, the theory goes, has the power to improve public policy by providing an outlet for experimentation; enhancing regional variation and capitalizing on local knowledge; and by imposing the discipline of competition for residents on regional governments.[13] Therefore, absent "collective action failure" or severe interjurisdictional externalities such as pollution, power should generally be assigned to the smallest unit of government that internalizes the benefits.[14]

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[9] 15 U.S.C. § 3722.

[10] MURO & KATZ, *supra* note 1, at 9.

[11] *See generally* Maryann Feldman & Lauren Lanahan, *State Science Policy Experiments*, *in* THE CHANGING FRONTIER: RETHINKING SCIENCE AND INNOVATION POLICY 287 (Adam B. Jaffe & Benjamin F. Jones eds., 2015).

[12] *See* Camilla A. Hrdy, *Patent Nationally, Innovate Locally*, 31 BERKELEY TECH. L.J. (forthcoming 2016) (manuscript at 1) (arguing that unlike patent law, innovation finance should often be supplied at the subnational level rather than the federal level in order to capitalize on the advantages of decentralized governance, local knowledge, and interjurisdictional competition).

[13] *Id.* at 27. *See also* Parts II.B and II.C, *infra*.

[14] *See* Hrdy, *supra* note 12, at 7; *see also* Robert D. Cooter & Neil S. Siegel, *Collective Action Federalism: A General Theory of Article I, Section 8*, 63 STAN. L. REV. 115, 137 (2010); ROBERT D. COOTER, THE STRATEGIC CONSTITUTION 104–06 (2000); Clayton P. Gillette, *Business Incentives, Interstate Competition, and the Commerce Clause*, 82 MINN. L. REV. 447, 448–49 (1997) (arguing that governmental incentives for businesses facilitate efficient competition for scarce resources and produce more effective allocation of resources to the region that most highly values them). Such theories

On the other hand, the federalism literature also teaches that, as an efficiency-promoting mechanism, interjurisdictional competition has limits.[15] For example, it assumes residents are mobile and that state and local governments have good information vis-à-vis the federal government and vis-à-vis the private sector.[16] There may also be cases where efficient outcomes and federal goals are in conflict. For instance, rules derived out of a competition for purely economic benefits may lead to laws that favor socially disfavored practices like child labor.[17] Lastly, competition may be imperfect as a result of interjurisdictional externalities (spillovers): if states do not internalize all the costs or benefits of their actions, they may be highly tempted to pass laws that export the costs to other regions or, conversely, decline to support activities that benefit other regions.[18]

Applying basic tropes of federalism, this Article proposes that the recent entry of the national government into cluster policy, and particularly the national cluster program codified in the America COMPETES Act, is an attempt by the federal government to "manage" local innovation policies in order to reduce the costs of decentralization and competition and improve national outcomes in growing clusters. As in other areas of law, such as environmental regulation, there are a variety of problems that might warrant federal intervention in the competition to grow clusters.

First, innovation clusters implicate significant externalities; but here the externalities are *positive*, rather than negative. Simply put, other regions can copy the innovations produced in a cluster or the results of cluster policy experiments funded by distant taxpayers.[19] This leads to two

often draw on Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64 J. POL. ECON. 416 (1956), either directly in the case of local public goods (e.g. bridges, fire departments), or by analogy. *See* William Bratton & Joseph McCahery, *The New Economics of Jurisdictional Competition: Devolutionary Federalism in a Second-Best World*, 86 GEO. L.J. 201, 206 (1997); Gillette, *supra*, at 448 & n.2.

[15] *See, e.g.*, Richard Schragger, *Decentralization and Development*, 96 VA. L. REV. 1837, 1853–59 (2010); David Super, *Rethinking Fiscal Federalism*, 118 HARV. L. REV. 2544, 2551–59 (2005).

[16] Schragger, *supra* note 15, at 1857–58.

[17] *See* Jack Balkin, *Commerce*, 109 MICH. L. REV. 1, 29–47 (2010) (describing a variety of collective action problems that he argues justify federal regulation under the Commerce Clause power in labor law, consumer protection law, environmental law, anti-discrimination law, and the health insurance market).

[18] *See* Allan Erbsen, *Horizontal Federalism*, 93 MINN. L. REV. 493, 514–28 (2008) (discussing the interactions of the states with one another and the interstate frictions that arise when states impose costs, or benefits, on one another in a variety of legal contexts).

[19] On interjurisdictional knowledge spillovers, see generally David B. Audretsch & Maryann P. Feldman, *Knowledge Spillovers and the Geography of Innovation*, *in* HANDBOOK OF URBAN AND REGIONAL ECONOMICS VOLUME 4: CITIES AND GEOGRAPHY 2713–35 (J. Vernon Henderson & Jacques-François Thisse eds., 2004). For

counter-intuitive results that are familiar to patent law scholars, if not necessarily to environmental law scholars. Regional governments may underinvest in innovating, or they may innovate but then adopt a policy of secrecy.[20] Both results may be bad from the perspective of national innovation policy: no one would have access to information that is never generated, and other regions in the United States would not have access to information that is kept secret. In consequence, society would lose out on the productive activities toward which that information might be put.[21]

Second, as in other contexts involving interjurisdictional competition—such as states competing for corporations and wealthy residents seeking favorable laws and tax treatment—cluster competition requires competing for the scarce inputs to innovation.[22] These scarce inputs include top-ranked firms, skilled talent, limited amounts of venture capital, and owners of intellectual property rights—the "new currencies of economic competition" in the knowledge economy.[23] Fierce competition to attract mobile residents may result in more innovation and higher productivity, giving the United States as a whole "an undeniable advantage over Europe, China, and India."[24] But it can also lead to negative consequences: wasteful expenditures by regional governments on incen-

applications to IP law and innovation laws generally, see generally John Duffy, *Harmony and Diversity in Global Patent Law*, 17 BERKELEY TECH. L.J. 685 (2002), and Michael Graetz & Rachel Doud, *Technological Innovation, International Competition, and the Challenges of International Income Taxation*, 113 COLUM. L. REV. 348 (2013).

[20] *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266–67 (1977). As I discuss in Part II.C.1, externalities result from first-order (technological) and second-order (legal) innovations.

[21] Brett M. Frischmann & Mark. A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257, 257–61 (2007).

[22] Interjurisdictional competition is generally defined as rivalry among governments in which each government is trying to win some *scarce* resource. Kenyon, *supra* note 2, at 14. For an analysis of interjurisdictional competition theories, see generally Bratton & McCahery, *supra* note 14.

[23] ORLY LOBEL, TALENT WANTS TO BE FREE: WHY WE SHOULD LEARN TO LOVE LEAKS, RAIDS AND FREE RIDING 7 (2013) (concluding that laws and policies that restrict worker mobility and knowledge transfer among firms, such as patents and non-competes, will ultimately be harmful for innovation-intensive industries). *But see* Jonathan M. Barnett & Ted Sichelman, *Revisiting Labor Mobility in Innovation Markets*, working paper (2016), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2758854 (challenging the assumption that legal regimes that allow strict non-compete agreements deter technological innovation).

[24] For a discussion of expected benefits of capturing an innovation cluster, see ENRICO MORETTI, THE NEW GEOGRAPHY OF JOBS 147–48 (2012). *See also* ATKINSON & EZELL, *supra* note 1, at 155–56 (pointing to evidence that industry clustering has become even more important to economic growth since the 1980s and linking clustering with an economy to "more innovation and higher productivity").

tives that far exceed a reasonable expectation of the ultimate benefits[25] or incentives whose main purpose is to lure businesses away from neighboring states.[26]

Lastly, efficiency aside, regional cluster competition has significant distributional consequences that are not taken into account by the basic economic federalism model.[27] Even assuming that competition to build regional innovation clusters is perfectly efficient and results in a stronger innovation economy overall, some regions will be losers in this race. And once they lose, it will be very difficult to catch up to regions with more human capital, more venture capital, and higher concentrations of knowledge and skill. Indeed, it seems the country is already divided into "dominant clusters" that "continually pull in firms, entrepreneurs and workers," and "lower tier regions" that find it "difficult . . . to break into the dominant groups."[28]

In recognition of the fact that regional cluster competition produces positive as well as negative effects for other regions, a strong theoretical case can be made for federal intervention. I argue the United States should embrace the kind of "managed localism" represented by the America COMPETES Act as a way to reduce many of the efficiency problems associated with regional cluster competition without eliminating the benefits of decentralization, local knowledge, and competition discussed in the economic federalism literature.[29] The question is which mechanism this management should take.

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[25] *See* Richard Florida, *The Uselessness of Economic Development Incentives*, CITYLAB (Dec. 7, 2012), http://www.citylab.com/work/2012/12/uselessness-economic-development-incentives/4081/ (arguing, with respect to state tax credits and subsidies for business generally, that "there is virtually no association between economic development incentives and any measure of economic performance").

[26] *See* Peter D. Enrich, *Saving the States from Themselves: Commerce Clause Restraints on State Tax Incentives for Business*, 110 HARV. L. REV. 377, 380 (1996); Enrico Moretti & Daniel Wilson, *State Incentives for Innovation, Star Scientists and Jobs: Evidence from Biotech*, 79 J. URB. ECON. 20, 21 (2014) (finding state R&D tax credits and biotech subsidies did increase economic development in the region, but that these benefits were probably the consequence of economic losses in other states).

[27] Robert P. Inman & Daniel L. Rubinfeld, *Rethinking Federalism,* J. ECON. PERSP., Fall 1997, at 43, 45–48.

[28] MILLS ET AL., *supra* note 5, at 12; JONATHAN ROTHWELL ET AL., METRO. POLICY PROGRAM, PATENTING PROSPERITY: INVENTION AND ECONOMIC PERFORMANCE IN THE UNITED STATES AND ITS METROPOLITAN AREAS 1, 3 (2013); *see also* MORETTI, *supra* note 24, at 82–84 (arguing that America's economic map is uneven); Porter, *supra* note 1, at 84 ("Once a cluster begins to form, a self-reinforcing cycle promotes its growth, especially when local institutions are supportive and local competition is vigorous. As the cluster expands, so does its influence with government and with public and private institutions.").

[29] I define managed competition in this context as using federal statutory, administrative, or judicial action to incent or place limits on local governments using subsidies, preemption, or mandates. *Cf.* Inman & Rubinfeld, *supra* note 27, at 48–54

To answer this question, we can look to an analogous context with a long history: patent law. The problems discussed above—difficulty of appropriation,[30] tendency toward secrecy,[31] rent-dissipating expenditures on research,[32] and even inequality[33]—are precisely the ones that lead governments around the world to create opportunities for inventors to obtain a limited period of exclusivity in exchange for disclosure of sufficient information required for others to implement the invention.[34] Regions that are racing against one another to design strategies for building successful innovation clusters in high-demand technology areas, such as IT or biotech, express pathologies similar to inventors racing to discover winning inventions. They under-invest in technology areas whose outputs cannot be appropriated by the region; they keep their strategies secret; they engage in duplicative spending; and they are highly unequal in their capacity to develop clusters.[35]

The "patent law solution" to this problem is to award exclusive rights over a particular kind of technology cluster to one or more regions in order to stop wasteful duplication of investment and provide an incentive to invest and disclose by reducing the opportunities for competition. However, the new federal program exemplified by the COMPETES Act uses a different solution. It gives selected regions federal grants in exchange for implementing and disclosing their cluster strategies. In other words, the government has chosen to employ "innovation finance"—direct public subsidies for innovation[36]—rather than intellectual proper-

(discussing various ways to manage spillovers within economic federalism, including central action or bargained agreements through "cooperative" and "democratic" federalism); s*ee also* Nestor Davidson, *Cooperative Localism: Federal-Local Collaboration in an Era of State Sovereignty,* 93 VA. L. REV. 959 (2007).

[30] Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, *in* THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS 609, 615 (1962).

[31] *See* SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 21 (Comm. Print 1958) (report by Fritz Machlup).

[32] *See* Yoram Barzel, *Optimal Timing of Innovations*, 50 REV. ECON. & STAT. 348, 348 (1968); *see also* Kitch, *supra* note 20, at 276 ("[A patent] puts the patent owner in a position to coordinate the search for technological and market enhancement of the patent's value so that duplicative investments are not made and so that information is exchanged among the searchers.").

[33] B. ZORINA KHAN, THE DEMOCRATIZATION OF INVENTION 182–221 (2005).

[34] *See, e.g.*, 35 U.S.C. §§ 101, 102, 103, 112, 154, 271 (2012).

[35] *See* Part II.C, *infra.*

[36] I have defined innovation finance as public financing for innovation in the form of grants, prizes, tax credits, or other investments in innovation such as education initiatives. *See* Hrdy, *supra* note 12, at 3, 17–23 (defining innovation finance and comparing innovation finance to intellectual property) (citing SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 242–43 (2004)) ("[A] single innovation may be funded in two ways: by the public sector out of general revenue, and through

ty. In theory, this will encourage regions to spend on "high spillover" research areas and to specialize in areas where they have a real comparative advantage—such as efficient energy in Philadelphia, Pennsylvania or 3-D printing in Youngstown, Ohio—rather than wasting money in a race to be winners in the same high-market-value technology fields. By choosing winners early in the process, and requiring collection and dissemination of information produced through these efforts, the federal government can encourage more efficient allocation of resources toward different technology areas and more sharing and collaboration among regions. In addition, the government can begin to tackle severe geographic inequality in the national innovation economy by explicitly favoring "lower-tier" regions that cannot otherwise afford to adopt successful innovation strategies. In other words, rather than relying on unbridled competition, government can effectuate a geographic redistribution of resources from richer to poorer states.

In drawing out these arguments, the Article proceeds as follows. Part I shows that there is already robust regional competition to grow clusters in the United States. (I refer to this as "natural" competition: competition among regional governments to grow innovation clusters that occurs absent federal intervention in the form of subsidy, regulation, or judicially mediated preemption.) It then explains the basic principles of cluster theory and suggests that each competing innovation cluster can be conceptualized—at a purely theoretical level—as a vertically and horizontally integrated firm consisting of firms, suppliers, investors, entrepreneurs, and skilled talent that achieve significant productivity and innovation benefits from operating in proximity. These benefits are, primarily, larger and more specialized labor markets, greater specialization among suppliers of inputs, and—uniquely important in this context—easier exchange of technical and market information. By locating in proximity to one another, members of a cluster can theoretically obtain these "agglomeration benefits," but without sacrificing the benefits of flexibility, specialization, and market-driven incentives that come from competition.[37]

Part II explains the limitations and costs of regional cluster competition for national innovation policy, discussing relevant literature and recent research. Specifically, I argue that, absent national intervention, regional cluster competition suffers from a variety of pathologies (akin to market failures in the "cluster as firm" analogy). These include positive externalities that limit investment in clusters and, equally significant, negative externalities resulting from competition for scarce resources. Regional competition can also produce severe geographic inequality among states and cities across the U.S. Even absent these issues, infor-

proprietary prices under an intellectual property regime.")).

[37] *See* discussion and notes *infra* Part I.A–B.

mation gaps with respect to cluster activity in other locations and with respect to location markets can also provide a justification for intervention from a higher level of government in order to optimize national outcomes from cluster development.

Part III introduces the new regional innovation program (RIP) authorized in the America COMPETES Act of 2010 in order to encourage development of innovation clusters. The program consists of two parts: grants for regional stakeholders that develop promising plans to develop innovation clusters, and an information collection and dissemination program.[38] To demonstrate how the grants work in practice, I showcase the largest cluster grant to date, given to the greater Philadelphia area for an "efficient energy buildings hub."

Part IV argues that the new cluster grant initiative represents a way for the federal government to "manage" regional cluster competition by addressing the specific problems highlighted in Part II. It also compares this innovation finance option to others that could theoretically achieve similar goals, such as creating exclusive rights, innovation and disclosure mandates, or preemption under the Patent Act and the Dormant Commerce Clause. While not recommending that the government employ exclusive rights, I do recommend drawing more heavily on a mixture of solutions. For example, to alleviate the risk that the prospect of federal grants will increase (rather than decrease) inefficient racing, I suggest that courts or federal agencies be given more latitude to preempt state and local government spending on innovation in certain circumstances.

I. NATURAL CLUSTER COMPETITION

State and regional governments within the United States are competing to create innovation clusters. I think of this as "natural" cluster competition: the competition among states, cities, and other smaller-than-federal localities to grow innovation clusters that occurs *absent federal oversight in the form of subsidy or preemption*. This Part discusses the origins and structure of natural cluster competition, and the theory behind using policy to facilitate development of clusters.

A. Origins of Regional Cluster Competition

States, cities, and other regional governments use a variety of strategies to grow innovation clusters.[39] They often focus their efforts on research and commercialization of research at the university interface.[40]

[38] 15 U.S.C. § 3722 (2012).

[39] See the wide variety of strategies categorized and assessed in Hrdy, *supra* note 12, at 48–59.

[40] *See, e.g.*, Martin Kenney & David Mowery, *Introduction* to PUBLIC UNIVERSITIES

Such efforts are closely linked to states' and cities' traditional role in providing education for their residents,[41] and their long-time focus on pushing applied research in their jurisdictions.[42] But state and local spending on innovation has increased substantially in the past thirty years.[43] State governments now spend well over $3 billion on public university facilities, funding for research, and grants for faculty recruitment.[44] This is more than is provided by industry.[45] Outside the university, states and cities spend billions of dollars every year on subsidies and tax credits for businesses that do R&D.[46] States are also increasingly funding their own venture capital units to supply high tech firms and local entrepreneurs with financing for commercializing inventions and taking new business models to market.[47]

AND REGIONAL GROWTH 1, 2 (Kenney & Mowery, eds., 2014) (noting that since the 1980s, "state governments and universities in the United States have launched a dizzying array of initiatives for the support of new-firm formation and technology commercialization based on university research"); *see also, e.g.*, NAS Symposium, *supra* note 6, at 93–105 (discussing various policies to build regional innovation clusters that involve engagement with research universities).

[41] Dennis Mueller, for example, has suggested that schooling represents a public good that "typically or at least feasibly could be provided at a very local level . . . ." *See* DENNIS C. MUELLER, CONSTITUTIONAL DEMOCRACY 81 (1996); *see also* COOTER, *supra* note 14, at 109 (noting that "[r]esearchers in a state university may discover new ideas that profit the state" though going on to note that education also is likely to produce positive externalities for other jurisdictions).

[42] As Peter Lee has observed, after states began operating federal land grant colleges under the Morrill Act, they typically supported *applied* research due partly to an interest in local development. Peter Lee, *Patents and the University*, 63 DUKE L.J. 1, 8–10 (2013) (discussing the Morrill Act and "the pragmatic orientation of U.S. academic institutions").

[43] For discussion of increasing regional focus on developing high innovation economies, see, for example, DAN BERGLUND & CHRISTOPHER COBURN, PARTNERSHIPS: A COMPENDIUM OF STATE AND FEDERAL COOPERATIVE TECHNOLOGY PROGRAMS 37–50 (1995), which surveys a wide variety of 1990s state technology development programs; Maryann Feldman & Maryellen Kelley, *How States Augment the Capabilities of Technology-Pioneering Firms*, 33 GROWTH & CHANGE 173, 174–95 (2002) (discussing state programs to assist technology development, including venture capital programs).

[44] NAT'L SCI. BD., SCIENCE AND ENGINEERING INDICATORS 2012, CHAPTER FIVE: ACADEMIC RESEARCH AND DEVELOPMENT 5–10, http://www.nsf.gov/statistics/seind12/c5/c5s1.htm.

[45] *See* Feldman & Lanahan, *supra* note 11, at 288 (citing NAT'L SCI. BD., *supra* note 44, at 5–11). This number does not include other forms of state support for universities, such as property tax abatements and financial aid for undergraduates, which totaled around $7.9 billion in 2008. NAT'L SCI. BD., SCIENCE AND ENGINEERING INDICATORS 2012, CHAPTER EIGHT: STATE INDICATORS 8–66.

[46] For a survey of state R&D tax incentives, see MICHAEL D. RASHKIN, RESEARCH AND DEVELOPMENT TAX INCENTIVES: FEDERAL, STATE, AND FOREIGN 1–4 (2007).

[47] On state public-venture capital, see Camilla A. Hrdy, *Commercialization Awards*, 2015 WIS. L. REV. 13, 53–56 (2015).

In making these investments, regions hope to capture and retain a variety of immediate and long-term economic benefits. These include tax revenues from companies that locate in the region or that choose to remain, including taxes on valuable patents and other IP.[48] Benefits also include less direct, but potentially far more significant, consequences from innovating industries locating in the region, like hiring of local workers and more patronage of local services.[49] Importantly, in innovation sectors, wages can be expected to be higher.[50]

In the long run, the hope is that, by investing wisely and offering targeted incentives, jurisdictions can generate investment in innovation that would not otherwise occur and create a more desirable environment for other firms working in the same field that can benefit by locating in proximity to one another, a phenomenon called "agglomeration benefits."[51] In other words, governments can use policy to artificially engineer innovation clusters.

B. Basic Theory: "Cluster as Firm"

Innovation clusters are generally defined as regional concentrations of large and small firms—including incumbents along with start-ups—that develop "creative" products and services in roughly the same industry, along with skilled workers, specialized suppliers, universities, and other businesses or institutions with relevance to the firms' market activity.[52] The concept is elusive, and is often accompanied with reference to examples of successful clusters, ranging from biotech in Boston, to information technology in Silicon Valley, to marine technologies in eastern North Carolina.[53] But there is a significant amount of theory behind the concept of innovation clusters and a large body of literature devoted to it in the disciplines of economics, business management, and public policy.

The basic theoretical principle driving regional and national cluster policies is that when a "critical mass" of these innovators and the people and organizations that service them come to locate in the same

[48] IP can be shifted abroad, which makes it more difficult to collect those taxes. *See* Graetz & Doud, *supra* note 19, at 399–401 (discussing complex tax planning structures used by multi-national corporations to reduce taxes to the low single digits or even zero on a substantial portion of their IP income).

[49] MORETTI, *supra* note 24, at 73–120 (discussing the wide variety of economic benefits for a region, such as Silicon Valley, that succeeds in developing a technology cluster).

[50] *Id.* at 88–97. *See also* discussion in Hrdy, *supra* note 12 , at 14–16.

[51] On agglomeration benefits generally, see, for example, PAUL KRUGMAN, GEOGRAPHY AND TRADE 36–38 (1994); Daniel Rodriguez & David Schleicher, *The Location Market*, 19 GEO. MASON L. REV. 637, 640–45 (2012).

[52] MURO & KATZ, *supra* note 1, at 10. This is the definition adopted at the 2009 NAS symposium. NAS Symposium, *supra* note 6, at 3.

[53] MURO & KATZ, *supra* note 1, at 16.

general vicinity, they will experience higher levels of innovation and productivity than if they were located at a distance.[54] This theory has a long lineage in economics surrounding "agglomeration economies,"[55] and has been drawn out in recent work by business management specialists such as Michael Porter and Maryann Feldman, policy analysts at the Brookings Institute, and a vast number of scholars who explore the role of proximity in mitigating the transfer of information.[56]

The most oft-discussed benefits of co-locating are the "Marshallian trinity," observed by Alfred Marshall in the late nineteenth century: larger and more specialized pools of skilled labor; larger and more specialized markets for suppliers of industry-specific inputs, such as hardware, venture capital, or manufacturing capabilities; and more efficient transfer of knowledge than would occur at a distance.[57] These three benefits are said to increase productivity and innovation through three mechanisms: market matchmaking,[58] sharing of investment in commonly

[54] NAS Symposium, *supra* note 6, at 3.

[55] *See generally* Rodriguez & Schleicher, *supra* note 51, at 640–45 (discussing agglomeration benefits in the context of city location markets); Lee Anne Fennell, *Agglomerama*, 2014 BYU L. REV. 1373 (2014) (discussing agglomeration benefits and agglomeration costs from the perspective of property theory).

[56] *See, e.g.*, KRUGMAN, *supra* note 51, at 36–38; Aaron Chatterji, Edward Glaeser & William Kerr, *Clusters of Entrepreneurship and Innovation* 2 (April 2013) (discussing academic work on spatial concentration of entrepreneurship and policies for promoting entrepreneurial clusters); Edward L. Glaeser, Hedi D. Kallal, José A. Scheinkman, & Andrei Shleifer, *Growth in Cities*, 100 J. POL. ECON. 1126, 1127 (1992) (arguing that, because geographical proximity facilitates transmission of ideas, knowledge spillovers are particularly important in cities). For examples of legal scholarship applying the theory of innovation clusters in specific contexts, see, for example, Abraham J. B. Cable, *Incubator Cities: Tomorrow's Economy, Yesterday's Start-Ups*, 2 MICH. J. PRIV. EQUITY & VENTURE CAP. L. 195, 202–08 (2013); Feldman, *supra* note 1, at 5–6; Michael Madison, *Contrasts in Innovation: Pittsburgh Then and Now*, *in* ENTREPRENEURSHIP AND INNOVATION IN EVOLVING ECONOMIES: THE ROLE OF LAW 111 (Megan M. Carpenter ed., 2012) (applying Benjamin Chinitz's framework for agglomeration economies, in which firms in one industry attract firms in other industries, and analogizing these to "'innovation' economies, in which innovation in one field leads to firm growth and to innovation and growth in adjacent fields").

[57] KRUGMAN, *supra* note 51, at 36–37 (quoting ALFRED MARSHALL, PRINCIPLES OF ECONOMICS 271–72 (Macmillan & Co., 8th ed. 1920)). Michael Porter notes a wider variety of benefits to clustering than the "Marshallian trinity"—such as complementarities and linkages among cluster members; shared access to institutions and public goods; and better motivation and measurement of progress due to local rivalries—but he draws on similar fundamental ideas. *See* Porter, *supra* note 1, at 81–83; *see also* Duranton, *supra* note 1, at 5–9 (noting this facet of Porter's conceptual framework and suggesting that Duranton's own sharing/matching/learning framework captures all of these benefits).

[58] The idea is that co-located firms experience larger and more specialized markets in which to buy, sell, and hire in, and that this leads to more efficient matching between outputs—whatever product or service the cluster specializes in—and inputs, such as specialized workers or high-quality venture capital firms. Porter,

used services and infrastructure, and learning from other cluster participants.[59] All of these benefits are driven by the singular benefit of reducing transportation costs "for goods, people and ideas."[60] In theory, any of the activities that go into producing a cluster output—hiring skilled labor, obtaining supplies, securing financing, or exchanging knowledge—could be performed at a distance.[61] But this may be extremely costly, and, in the first and last cases, prohibitively so.[62] Simply put, when participants in a cluster permanently co-locate, they lower their costs by not paying to move things around, and still get to experience the benefits of proximity.

The most influential conceptualization of clusters comes from Michael Porter, whose views have had a significant impact on American cluster policy and cluster policies throughout the world.[63] The cluster, he writes, represents a "new spatial organizational form" in which innovators, suppliers, and talent all locate in proximity in order to benefit off of each other's presence in a variety of ways.[64] Locating in spatial proximity "increase[s] the productivity of companies based in the area," "drive[s] the direction and pace of innovation," and "stimulat[es] the formation of

supra note 1, at 81–83.

[59] *See* Duranton, *supra* note 1, at 9; *see also* Fennell, *supra* note 55, at 1378 (noting this influential taxonomy).

[60] Fennell, *supra* note 55, at 1379, (quoting Edward Glaeser's similar observation in EDWARD L. GLAESER, CITIES, AGGLOMERATION, AND SPATIAL EQUILIBRIUM 6–8, 117 (2008)).

[61] Efficient outsourcing is thought to be possible for a variety of inputs, including customer service and manufacturing, though some suggest outsourcing manufacturing can reduce innovation capacity by segregating the research function from the production function. *See, e.g.*, SUZANNE BERGER, MAKING IN AMERICA: FROM INNOVATION TO MARKET 49 (2013) (arguing that when new technologies are being commercialized, having R&D and manufacturing in close proximity can help optimize product design and production and enhance innovation); Gary Pisano & Willy Shih, *Does America Really Need Manufacturing?* HARV. BUS. REV., Mar. 2012 94, 94–96 (providing a model for determining when manufacturing is critical to invention process or can safely be outsourced to lower costs and reduce capital outlays).

[62] Peter Lee, *Transcending the Tacit Dimension: Patents, Relationships, and Organizational Integration in Technology Transfer*, 100 CALIF. L. REV. 1503, 1537 (2012) ("[T]he role of *people* as vehicles for transmitting tacit knowledge contributes significantly to geographical clustering because tacit knowledge transfer 'requires frequent interaction that proximity facilitates.'") (quoting Juan Alcácer & Wilbur Chung, *Location Strategies and Knowledge Spillovers*, 53 MGMT. SCI. 760 (2007)); *see also* Duranton, *supra* note 1, at 11 (noting that labor and firms' knowledge present "more complicated cases" for mobility).

[63] Porter is the author of a series of articles on clusters and the founder of the U.S. Cluster Mapping Project. *See Project Leadership Team*, U.S. CLUSTER MAPPING, http://www.clustermapping.us/content/project-leadership-team (last visited Mar. 16, 2016).

[64] Porter, *supra* note 1, at 79.

new businesses."[65] This, in turn, "expands and strengthens the cluster itself."[66]

Although Porter draws implicitly on the theory of agglomeration economies discussed above, he often refers to the benefits of clustering using business management terms like "complementarities" and "economies of scale."[67] In this view, the cluster is analogous to a *vertically and horizontally integrated firm*, in which related, often directly competing companies, as well as employed talent and suppliers, all locate in the same area in order to achieve the benefits of a spatial, if not a corporate, merger. In Porter's words, "[a] cluster allows each member to benefit *as if* it had greater scale or *as if* it had joined with others formally—without requiring it to sacrifice its flexibility."[68]

C. Innovation Clusters Distinguished

Cluster theory is sometimes conflated with the more general concept of agglomeration economies, where the same Marshallian trinity is frequently applied to explain why people and businesses locate in cities or in particular neighborhoods within cities.[69] According to Paul Krugman, whose work on economic geography is closely related to cluster theory, the conceptual frameworks are basically identical. The externalities produced in "high-technology clusters," he writes, "look rather similar" to those produced in a non-high-tech cluster, such as a community of shoemakers.[70] The same factors—labor force, suppliers, and access to information—control productivity and location decisions in each case.[71]

But many scholars of intellectual property law and innovation policy would disagree with Krugman's suggestion. *Innovation clusters are different*. The main reason is that participants are engaged in comparatively high levels of basic and applied research and generate abnormal amounts of new and valuable information, often involving basic science,

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[65] *Id.* at 80.

[66] *Id.*

[67] *Id.* at 79–80. For this point, see also Duranton, *supra* note 1, at 5 (noting that Porter seems to rely on Alfred Marshall and the usual mechanisms of agglomeration benefits).

[68] Porter, *supra* note 1, at 80. In a different context, Peter Lee has used a similar analogy, arguing that commercial companies decide whether to vertically integrate university inventors based partly on the degree of transaction costs involved in obtaining their tacit knowledge. *See* Lee, *supra* note 62, at 1511, 1547.

[69] KRUGMAN, *supra* note 51, at 36–38.

[70] *See id.* at 63–67 (arguing that "high-technology clusters" and non-high-tech clusters, such as a community of shoemakers, can "look rather similar," with the same factors—labor force, suppliers, and access to information—controlling productivity and location decisions).

[71] *Id.*

and often centered around a university.[72] Innovation, and the new information and knowledge innovation produces, generates externalities or what are often called "knowledge spillovers"—where innovation benefits others without compensating creators.[73] What is more, innovation spillovers *are not confined to a region*. Although, as just explained, certain kinds of knowledge can be far more difficult to exchange at a distance than in proximity,[74] it is believed that all knowledge eventually, and indeed inevitably, spills over across borders and benefits regions outside the jurisdiction in which it originated.[75]

For my purposes, the implication of the severe externalities produced in innovation clusters is manifold. First, the case for policy intervention in the form of exclusive rights, grants, or some other incentive to innovate is much stronger for an innovation cluster devoted to science and technology-based research than it would be for, say, Krugman's hypothetical shoemaking cluster. Second, due to the potential for productive cross-border spillovers of knowledge among regions within the U.S., the federal government's interest in passing policies that encourage such spillovers may be high. Lastly, because the externality problem experienced in innovation clusters is, in Porter's "cluster as firm" framework, similar to the externality problem experienced in patent law, theoretical models designed for patent law, such as Kitch's prospect theory, can be quite useful in analysis of innovation clusters. At a conceptual level, a regional innovation cluster can be thought of as a merged firm whose participants generate positive knowledge externalities that benefit other jurisdictions within the United States. This is conceptually analogous to an inventor who generates positive externalities that benefit others within a market. In the next Part, I discuss in more detail the various "market failures" that afflict development of regional innovation clusters, just as

[72] The cluster literature provides substantial insights on the "ingredients" that might be required for a successful innovation cluster, including a strong science base. *See, e.g.*, Luigi Orsenigo, *Clusters and Clustering: Stylized Facts, Issues, and Theories*, *in* CLUSTER GENESIS: TECHNOLOGY-BASED INDUSTRIAL DEVELOPMENT 195, 205–06 (Pontus Braunerhjelm & Maryann Feldman eds., 2006) (listing a variety of requisites for an innovation cluster, such as a science base, institutions, infrastructure, and "a favorable intellectual property (IP) regime").

[73] *See* Adam B. Jaffe, Manuel Trajtenberg & Michael S. Fogarty, *Knowledge Spillovers and Patent Citations: Evidence from a Survey of Inventors*, 90 AM. ECON. REV. 215, 215 (2000) ("It is well understood that the non-rival nature of knowledge as a productive asset creates the possibility of 'knowledge spillovers,' whereby investments in knowledge creation by one party produce external benefits by facilitating innovation by other parties."). On innovation spillovers generally, see Frischmann & Lemley, *supra* note 21, at 262.

[74] *See, e.g.*, Lee, *supra* note 62, at 1521 (asserting that university inventors "retain highly valuable 'tacit' knowledge regarding their inventions," and that "direct relationships with inventors represent the most effective conduit for transferring this knowledge to licensees").

[75] *See supra* note 19.

market failures afflict development of new inventions. In Parts III and IV I will discuss potential federal interventions in this cluster competition in order to effectuate the federal goals of increased national levels of innovation and reduction in regional inequality.

II. MARKET FAILURES

It may be that natural cluster competition, in which states and cities compete amongst one another to develop favorable innovation climates and offer incentives for innovators to come to their jurisdictions, is the most efficient way to generate good cluster policy. If so, then federal intervention, whether in the form of subsidy or regulation, is both unnecessary and undesirable. As I discuss below, some theories of federalism suggest that in many cases local sovereignty and decentralization of authority are preferable to top-down policymaking. However, I then go on to argue that, as in the case of environmental law or immigration policy, various "market failures," including externalities and information asymmetries, may interfere with the operation of an efficient, decentralized market for innovation clusters.

A. Competitive Federalism Theory

According to some literature on federalism, robust interjurisdictional competition can facilitate better public law and policy.[76] The benefits are hypothesized to accrue through a variety of mechanisms, including allowing for regional variations in policy design, permitting application of local officials' superior knowledge about local problems, producing experiments from which other governments can learn, and imposing the discipline of competition on decentralized sovereigns.[77]

According to the "market preserving federalism" theory, policymakers must make choices under the threat that new firms will not come to the jurisdiction or that existing ones will exit.[78] This forces their actions to better align with natural market forces and avoids deadweight loss in the form of market distortions and wasted government money.[79] At

[76] *See, e.g.*, Jonathan Adler, *Interstate Competition and the Race to the Top*, 35 HARV. J.L & PUB. POL'Y 89, 89 (2012). For a discussion of the race to the top model in the context of corporate law, see, for example, Roberta Romano, *Law as Product: Some Pieces of the Incorporation Puzzle*, 1 J.L. ECON. & ORG. 225, 233–35 (1985) (empirically testing the effects of state competition for the business of corporate charters).

[77] Adler, *supra* note 76, at 89–95 (discussing benefits of interjurisdictional competition).

[78] *Id.* at 91–92 (citing Barry Weingast, *The Economic Role of Political Institutions: Market-Preserving Federalism and Economic Development*, 11 J.L. ECON. & ORG. 1 (1995), and sources discussed in Jonathan Rodden & Susan Rose-Ackerman, *Does Federalism Preserve Markets?*, 83 VA. L. REV. 1521, 1530 n.45 (1997)).

[79] *See id.* at 92.

the same time, when local policymakers promote regional economic development in competition with other jurisdictions, they facilitate the competitive market for mobile firms, leading to more efficient matching of firms to regions.[80] According to this theory, associated with Charles Tiebout, if we allow states and cities to support local enterprise and innovation, whether through funding of public goods or through incentives for private firms, states and cities will capitalize on their informational advantages to create laws and policies that best serve the interests of local innovators; and innovators in turn will locate where they are valued most highly.[81] Lastly, a fortuitous side effect of policy localization is that local officials gain specialized expertise and produce valuable experiments that can be reapplied by other states or perhaps at the federal level.[82]

B. Reasons for Doubt

A correlative of the market-preserving federalism story is that, in order to take advantage of the benefits of efficiency-promoting localization and regional competition, federal intervention should generally be limited.[83] However, there are reasons to doubt that natural cluster competition is either efficient or fair from the perspective of everyone in the country. As noted in literature on federalism in other areas of law, interjurisdictional rivalry comes with significant costs. Simply put, when states compete to attract residents using positive incentives like tax credits, this may lead to a "race to the bottom" rather than a "race to the top." States may intentionally or inadvertently pass laws and policies that harm their own interests and the interests of other states. Commentators have discussed these dynamics in a variety of areas of law, including corporate law,[84] trust law,[85] environmental law,[86] and immigration law.[87]

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[80] Gillette, *supra* note 14, at 448–49 & 448 n.2 (citing Tiebout, *supra* note 14, at 416) (arguing that governmental incentives for businesses facilitates efficient competition for scarce resources and produces more effective allocation of resources to the region that most highly values them).

[81] *Id.*

[82] New State Ice Co. v. Liebmann, 285 U.S. 262, 310–11 (1932). Fromer has used a similar theory to support district court experimentation in patent laws versus uniformity. Jeanne C. Fromer, *Patentography*, 85 N.Y.U. L. REV. 1444, 1447–48 (2010) (arguing that, by restricting venue in patent cases to defendants' principal place of business, district courts can act as "patent laboratories" for the Federal Circuit).

[83] For example, according to the "collective action federalism" theory, absent collective-action failure or severe spillovers, power should generally be assigned to the smallest unit of government that internalizes the benefits. *See* Cooter & Siegel, *supra* note 14, at 137*; see also* COOTER, *supra* note 14, at 106. For further discussion of federalism theory and its application to innovation policy, see Hrdy, *supra* note 12 , at 24–38.

[84] A paradigmatic example of a "race to the bottom" comes from state corporate law, where some argue states craft lenient laws in order to attract corporations into their borders—to the potential detriment of other states and corporate shareholders.

The risk that a race to the bottom will develop can be exacerbated by a variety of features, all of which may be present in this case. First is the threat of regulatory capture—where industry participants actively push states to adopt laws favorable to them even if not actually in the public interest.[88] Second is the significant possibility for interjurisdictional externalities. When regions do not internalize all, or even most, of the effects of their actions, this means that they may be more likely to take measures that harm their neighbors and less likely to take measures that help their neighbors.[89] Externalities can lead to laws and policies that are bad from the national perspective, if not necessarily the local perspective.

C. Pathologies of Regional Cluster Competition

This Section discusses how these dynamics play out in the context of regional cluster competition. From the national (and sometimes also local) perspective, there are several potential problems with regional cluster competition that might justify federal intervention. The main ones discussed are: 1) positive externalities that reduce regional incentives to innovate, 2) a tendency toward secrecy, 3) rent-dissipating expenditures, 4) lack of information about the state of national and global markets and activities in different regions, and 5) geographic inequality.

1. Externalities

In areas of law such as environmental regulation, the major problem associated with interjurisdictional competition is negative externalities. For example, a state hoping to attract business and boost the local economy may permit high levels of pollution that disturb the environ-

See Lucian A. Bebchuk, *Federalism and the Corporation: The Desirable Limits on State Competition in Corporate Law*, 105 HARV. L. REV. 1435, 1438–39 (1992).

[85] *See generally* Robert H. Sitkoff & Max M. Schanzenbach, *Jurisdictional Competition for Trust Funds: An Empirical Analysis of Perpetuities and Taxes*, 115 YALE L.J. 356 (2005).

[86] *See* Richard Epstein, *Waste & the Dormant Commerce Clause*, 3 GREEN BAG 29, 35–36 (1999) (arguing that states should be allowed to place limits on shipments of waste into their borders in order to prevent externalities).

[87] *See* Keith Cunningham-Parmeter, *Forced Federalism: States as Laboratories of Immigration*, 62 HASTINGS L.J. 1673, 1707–27 (2011) (arguing that state immigration laws harm other states by encouraging unauthorized immigrants to resettle in other jurisdictions, thereby exporting the economic damage they claim illegal immigration causes).

[88] *See* Daniel Carpenter & David A. Moss, *Introduction* to PREVENTING REGULATORY CAPTURE: SPECIAL INTEREST INFLUENCE AND HOW TO LIMIT IT 1, 13 (Daniel Carpenter & Howard A. Moss eds., 2014) (defining regulatory capture as "the result or process by which regulation . . . is consistently . . . directed away from the public interest . . . *by the intent . . . of the industry itself*") (emphasis added).

[89] *See* Erbsen, *supra* note 18, at 514–28 (discussing the interactions of the states with one another and the interstate frictions that arise when states impose costs on one another in a variety of legal contexts)*; see, e.g.*, Adler, *supra* note 76, at 95–96 (arguing that the most compelling justification for federal intervention is spillovers).

ment of a neighboring state. The polluting state may not internalize all these costs when pollution floats over its borders and disturbs the environment of a neighbor state.[90] Thus, federal intervention is sometimes thought justified.[91]

But in the context of innovation clusters and regional innovation policy, the main problem is *positive* externalities, also called spillovers. As Allan Erbsen has observed, education presents a classic case of states producing positive externalities for others.[92] States invest significant public money in universities in order to create an educated populace and a source of academic research and skilled students for local industry. But the state has little assurance that the research performed at state universities or the students educated at them will remain in the area.[93] Innovation clusters experience the same problem. Local policies support the growth of clusters, which in turn produce innovations that are likely to benefit other places.

In the short-term, these innovation spillovers are desirable from the perspective of national welfare: other regions can instantly benefit from access to the information and know-how produced in a cluster, and their governments and residents can make "productive re-uses" that the original creators could not have made on their own.[94] But innovation spillovers can potentially reduce incentives to innovate in the first place.[95] Thus, it is important to consider them when evaluating the case for federal intervention.

Innovation clusters produce two kinds of innovation that may be vulnerable to free-riding problems: first-order and second-order innovation.[96] First-order innovations are the innovative outputs of the cluster

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[90] *See, e.g.*, Epstein, *supra* note 86, at 35; Joshua D. Sarnoff, *The Continuing Imperative (but Only from a National Perspective) for Federal Environmental Protection*, DUKE ENVTL. L. & POL'Y F. 225, 266–84 (1997).

[91] *See, e.g.*, Adler, *supra* note 76, at 95–96; Sarnoff, *supra* note 90, at 266–68 (discussing interjurisdictional spillovers and races to the bottom as potential reasons for federal environmental regulations).

[92] *See* Erbsen, *supra* note 18, at 524 (discussing positive externalities of state universities and the Supreme Court's justification for allowing higher tuition rates for out-of-state residents).

[93] *Id.*

[94] Frischmann & Lemley, *supra* note 21, at 281 ("Innovation is cumulative and is generally spurred by *decentralized* competition. This is particularly likely to be true of an innovation subject to productive reuse, since no one owner can capture the full value of that innovation anyway.") (footnotes omitted).

[95] *But see* Frischmann & Lemley, *supra* note 21, at 276 ("[W]hile we need some ex ante incentive to innovate, we don't need (and don't particularly want) full internalization of the benefits of an invention.").

[96] For similar division between first- and second-order innovation with respect to patent law and policy, see Lisa Larrimore Ouellette, *Patent Experimentalism*, 101 VA. L. REV. 65, 65, 86–87 (2015).

participants, including inventors, firms, their employees, and research institutions.[97] If these innovations are free to copy outside the state without compensation, then local governments are unlikely to invest in creating them. For example, a local government is unlikely to invest in basic science with no expected commercial application in the jurisdiction in the near term.

Local governments may also engage in second-order innovation—innovation in law and policy adopted by regional governments in attempting to grow innovation clusters.[98] However, like a firm's innovations, a region's innovations in law and policy are theoretically vulnerable to free riding absent some form of national intervention.[99] As Brian Galle creatively puts it, "State and local governments can be thought of as inventors without patents: because anyone can steal their new ideas, what incentive have they ever had to invent?"[100]

The line between first- and second-order innovations is not always clear. For example, if a state designs a better-calibrated system of R&D tax credits—a second-order innovation—this legal innovation should lead to more firms and research institutions locating in the region and performing R&D, which in turn produces first-order innovations that might leave the state.[101] Concerns that neighboring jurisdictions will free ride on the region's investments in the R&D tax credit as a law, and the R&D produced by firms responding to the tax credit, may lead policymakers to decide to eliminate the tax credit, even if firms really do need more incentives to invest in R&D than exist. For instance, in 2003, California's Legislative Analyst's Office (LAO) concluded that "state-level subsidization of R&D activities is difficult to justify because spillover effects cannot be confined to within a state."[102]

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[97] *Id.* at 65.

[98] *Id.* at 68.

[99] *See* Brian Galle & Joseph Leahy, *Laboratories of Democracy? Policy Innovation in Decentralized Governments*, 58 EMORY L.J. 1333, 1335, 1346 (2009) (arguing that state governments may produce lower than optimal levels of legal innovation due to the risk of free riding).

[100] *Id.* at 1335.

[101] On state R&D tax credits, see RASHKIN, *supra* note 46, at 275–532.

[102] LEGISLATIVE ANALYST'S OFFICE, AN OVERVIEW OF CALIFORNIA'S RESEARCH AND DEVELOPMENT TAX CREDIT 9 (2003). Notably, the tax credit was not eliminated. California, like most states, still has an R&D tax credit. *California Research Credit*, ST. CAL. FRANCHISE TAX BOARD, https://www.ftb.ca.gov/businesses/credits/rd/. The reason may be that California believes it captures enough of the benefits of the R&D performed in the state to justify the credits despite the risk of spillover. Another possibility is competitive pressure from other states and the fear of "brain drain." I discuss this issue further below.

2. A Tendency Toward Secrecy

A correlative of the fact that innovation clusters produce spillovers for other regions is that regional governments, not unlike firms, may strive to keep new and valuable information secret, especially when competing in the same industries or technology areas. The secrecy pathology can apply to first-order innovations, such as biotech research done at a firm located in a state, and second-order policy innovations: strategies the state uses to stimulate biotech research in the area.[103] As a result, state and regional governments may have strong incentives, and be under strong political pressure, to pass laws and policies that allow firms to keep their innovations secret and hide them from other regions.

The major way that states do this is through trade secret laws, which protect firms' valuable information from misappropriation so long as it is subject to reasonable efforts at secrecy.[104] Trade secret laws are usually assessed as a way for firms to keep secret knowledge internal to a firm, decrease the costs of information sharing within firms, and provide firms with incentives to innovate in areas that are not protected by federal IP.[105] However, another way to look at trade secret laws is from states' perspectives as innovating regions trying to prevent interjurisdictional spillovers. In this view, trade secret laws could be a way to keep firm knowledge *in the state*.

3. Rent Dissipation

Another problem associated with regional cluster competition is the reverse of the first: rather than underinvesting in innovation clusters, regions may overinvest in innovation in a manner that dissipates the benefits for the relevant jurisdiction or for the nation as a whole.[106]

As Peter Enrich has observed, there are two distinct types of rent dissipation in this context.[107] The first is pure overspending: paying too much public money in exchange for benefits that never materialize or that do not make up those expenditures.[108] The incentives may be unnecessary and make no difference in companies' decisions about where to

[103] Galle & Leahy, *supra* note 99, at 1351.

[104] Unif. Trade Secrets Act, 14 U.L.A. § 11 (1985).

[105] *See* Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 484 (1974) (addressing whether state trade secret laws may conflict with the goals of federal patent law to promote disclosure of information, and concluding they do not and may create better-calibrated innovation incentives).

[106] *See* Barzel, *supra* note 32, at 348 (observing that over-investment in innovation due to competition between potential innovators for some reward may dissipate the rewards from innovation).

[107] Enrich, *supra* note 26, at 380.

[108] *Id.* at 397–99. It is exceedingly difficult to measure whether economic benefits are worth the price for taxpayers. *See* Gillette, *supra* note 14, at 452 (noting difficulty of empirically measuring the effects of a subsidy for the jurisdiction).

locate.[109] Even when companies do pay attention to an incentive, Enrich says, governments may be overpaying based on unrealistic predictions of future benefits.[110] Enrich's work related to tax incentives, generally, but overspending may be especially likely to happen where the tax or subsidy is directed at research and development. Valuing innovation and predicting its future value are very difficult. In one estimate, around nine out of ten technology ventures are doomed to fail.[111] Thus, despite best intentions and no industry capture, policymakers may spend too much simply due to lack of good information or lack of ability. For example, a state may decide to grow a biotech cluster in order to generate wealth for the region, but in doing so it spends more on subsidies than it makes up with increased jobs, tax revenues, or indirect benefits like investment in local services.

Overspending may not initially concern a federal policymaker. If a state or city spends too much on growing an innovation cluster, it should suffer the consequences, such as less money to spend on basic infrastructure. Assuming we believe the "market-preserving" model of federalism, residents should flee the jurisdiction, and the market should correct itself, leading to more efficient spending in future.[112] However, if residents do not or cannot flee, or there is some other reason the jurisdiction does not stop spending unwisely, such as industry capture and fear of capital flight to other states, then this could become a problem for national innovation policy if it significantly distorts incentives to invest in innovation.[113] For example, it could be that the United States should only have 500,000 operating biotechnology companies, but several states continue offering tax breaks to biotech companies beyond this amount.[114] As a result, private capital may be diverted to commercializing biotech re-

[109] *See* Enrich, *supra* note 26, at 391–92.

[110] *See id.* at 402–05; *see also id.* at 390–94, 397–98 (noting absence of empirical evidence for the cost-effectiveness of tax incentives). There are various reasons states may overpay, including insufficient information about a company's value (*see id.* at 402) or policymakers' vulnerability to corruption and rent-seeking, leading them to give taxpayer money to firms for reasons outside the public interest. *See id.* at 394–95, 402. Also, some argue that when multiple states are bidding for the same firm, winners may bid more aggressively than is required due to cognitive errors (the "Winner's Curse" argument). *See* Gillette, *supra* note 14, at 451, 454–55.

[111] *See generally* F.M. Scherer & Dietmar Harhoff, *Technology Policy for a World of Skew-Distribution Outcomes*, *in* Taking Technical Risks 125 (Lewis M. Branscomb & Philip E. Auerswald eds., 2001).

[112] *See* Adler, *supra* note 76, at 91–92.

[113] This is similar to the problem discussed in the context of federal grants and prizes for innovation: when the government gives money to projects that were doomed to fail anyway, this can "divert[] innovators' attention from more useful endeavors." Daniel J. Hemel & Lisa Larrimore Ouellette, *Beyond the Patents–Prizes Debate*, 92 Tex. L. Rev. 303, 327 (2013).

[114] On city venture development funds, see generally Cable, *supra* note 56.

search that should have gone to more productive types of innovation or that should not have gone to innovation at all.[115]

The second type of rent-dissipating spending that can occur, also noted by Enrich and others such as former governor of Michigan Jennifer Granholm, is where states and cities end up competing with one another for the same businesses and the same markets: a zero-sum competition.[116] In this circumstance, local innovation incentives may benefit regions but "do not provide—and are not meant to provide—a net benefit to the nation as a whole . . . . [T]he business that one state attracts is a business that otherwise would have gone to another state."[117]

For instance, several states are striving to become the next "Silicon Valley for drones." North Dakota has "spent about $34 million fostering the state's unmanned aerial vehicle business," claiming that "Silicon Valley has the big money and know-how . . . but North Dakota can take unmanned aerial vehicles . . . from a fast-growing hobby to an industry."[118] However, North Dakota is not the only region seeking to become the next drone destination. Alaska and San Diego, California, among many others, also have economic development strategies centered around the emerging unmanned aerial vehicles industry.[119] Assuming there can only be a certain number of clusters specializing in drones, some of the states and cities are going to end up wasting money. At best, they may succeed in attracting companies and talent from other states, potentially leading to economic gains locally, but not nationally.

There is some evidence to support that the zero-sum game is already occurring, at least in the context of incentives for R&D and biotech. According to economists Enrico Moretti and Daniel Wilson, who have been tracking these incentives for years, state R&D tax credits, re-

[115] *See* N. GREGORY MANKIW, PRINCIPLES OF MICROECONOMICS 159 (2012).

[116] Enrich, *supra* note 26, at 398 (arguing that, even assuming investment tax incentives "can, in special circumstances, strengthen the offering state's economy," from a nationwide perspective, they are "at best a zero-sum game"). Many commentators, including state politicians themselves, have made similar arguments about state development incentives. *See, e.g.*, JENNIFER GRANHOLM & DAN MULHERN, A GOVERNOR'S STORY: THE FIGHT FOR JOBS AND AMERICA'S ECONOMIC FUTURE xi (2011) (arguing, based on Granholm's experience as governor, that business incentives such as those Michigan gave to automobile manufacturers result in a wasteful "state-versus-state competition" for the same companies).

[117] Enrich, *supra* note 26, at 398.

[118] Quentin Hardy, *A Silicon Valley for Drones, in North Dakota*, N.Y. TIMES (Dec. 25, 2015), http://nyti.ms/1Tk6uUB.

[119] UNIV. OF ALASKA CTR. FOR ECON. DEV., UNMANNED AIRCRAFT SYSTEMS: AN ECONOMIC DEVELOPMENT STRATEGY FOR ALASKA 8 (2015), https://www.commerce.alaska.gov/web/Portals/6/pub/AlaskaUASStrategy.pdf; Michele Nash-Hoff, *California's Unmanned Aircraft Systems (UAS) Industry at a Crossroads*, INDUSTRYWEEK: INSIDE CAL. MFG. (June 17, 2014), http://www.industryweek.com/blog/californias-unmanned-aircraft-systems-uas-industry-crossroads.

cruitment incentives for "star scientists," and industry-specific biotech subsidies for firms probably do improve the economies of the regions that pay for them.[120] But they find that nearly all of the resulting gains come at the expense of reduced R&D spending and fewer star scientists in other states.[121] In other words, the states offering these incentives are building their own backyards, but only at the expense of their neighbors'.

If true, Moretti and Wilson's empirical story would cast doubt on the notion that localization of authority enhances national productivity. However, importantly, their research does not necessarily tell us anything about all cluster initiatives, only the very limited types of incentives they studied R&D tax credits and biotech subsidies. Also, it is very difficult to measure the effects of incentives on overall levels of innovation, let alone the effects on innovation in other jurisdictions.[122] It could be that by granting incentives, governments are resolving information asymmetries in location markets and leading to more productive investments than would otherwise occur.[123]

4. Information Gaps

Another major pathology of regional cluster competition has to do with information. In theory, regional governments with perfect information about their own and other regions' markets could efficiently allocate resources toward developing precisely the right type, size and composition of innovation cluster. However, regional governments may lack the information required to take such actions. A single state or city government may have good information about its own resources, markets, and industry participants, but *not* those of other regions. Specifically, regional governments may not have full information about the availa-

[120] Notably, Moretti and Wilson do not attempt to measure whether these subsidies are a "good use of taxpayer money" and concede that they "have little to contribute to the question of local efficiency of place based policies." Moretti & Wilson, *supra* note 26, at 21. Thus, it could be states are significantly overpaying for the benefits they obtain.

[121] *See id.* at 20–22 (finding that most of the economic gains from state innovation incentives—including R&D tax credits, incentives for university researchers, and subsidies for biotech firms—resulted from shifting the location of the activity); *see also* Daniel J. Wilson, *Beggar Thy Neighbor? The In-State, Out-of-State, and Aggregate Effects of R&D Tax Credits*, 91 REV. ECON. & STAT. 431, 435 (2009) (finding evidence of increased in-state investment but that the net effect on R&D spending as a result of state R&D tax credits is close to zero).

[122] As I have discussed, Moretti and Wilson's findings are based on several questionable assumptions: in particular, the assumption that no innovation is produced from the subsidies that ultimately benefit other states through spillovers. Also, like most such studies, they rely on patent counts to measure innovation; this measure is both over and underinclusive. Camilla A. Hrdy, *Moretti & Wilson: Do State Innovation Incentives Work?*, WRITTEN DESCRIPTION (Aug. 22, 2013), http://writtendescription.blogspot.com/2013/08/moretti-wilson-do-state-incentives-for.html.

[123] *See generally* Gillette, *supra* note 14.

bility and location of cluster inputs—the firms, labor, capital, and other resources required to grow the cluster—that need to come from outside the region. They also may not have full information regarding the demand and supply of cluster outputs—the products, services, technology, IP, etc., produced by a cluster.

In sum, individual regions know what they are doing with respect to clusters, but they may not know what other regions, in the United States or abroad, are doing. Thus, they may not know how best to invest their resources, which firms or types of firms they should seek to attract, or where those participants are. Due to its broad jurisdiction, the federal government may possess, or have the ability to obtain, more information than regional governments regarding existing clusters and cluster input and output markets in a wider geographic space. This information would be highly useful in developing more optimal cluster geography and specialization.[124]

Another kind of information gap is in the private sector rather than the public sector. Although a core principle of most intellectual property theory is that decentralized private actors, guided by a desire for profits and directed by the forces of supply and demand, generally have more information about innovation developments than governments,[125] they may lack information about where to locate their operations.[126] Companies make locational decisions based on a variety of factors, including the cost of land and labor, the presence of certain natural resources, and the quality of public infrastructure.[127]

There are two types of information asymmetry in location markets. The first is *intra*jurisdictional, where entities *within* a particular innovation cluster lack information that leads them to fail to coordinate with one another when doing so would be in their interests and the interests of the cluster.[128] An important example is technology and skilled labor markets. In highly specialized technological fields, the needs of a company are likely to be highly specific. They need very specific kinds of research and very specific kinds of human talent to work for them. Yet firms may lack information regarding research being done at other firms and therefore fail to enter into a licensing deal or partnership even though it would be mutually beneficial.[129] This problem can also occur at

[124] *See* MILLS ET AL., *supra* note 5, at 31 (noting need for national information regarding geography of clusters and markets as a major justification for federal action).

[125] *See, e.g.*, SCOTCHMER, *supra* note 36, at 83–84.

[126] To get an idea of information asymmetries in location markets, I conducted an interview with the Principal at RSH Consulting Group, Inc. (a site-selection company) (Jan. 7, 2015). *See* http://www.thershgroup.com/.

[127] *See* Rodriguez & Schleicher, *supra* note 51, at 638, 640–41.

[128] Gillette, *supra* note 14, at 457–61.

[129] Patents and IP theoretically can assist efficient technology transfer by

the university–industry interface. While some universities make it their mission to seek out local companies doing research and working on problems related to the academic research and students within the university's walls, others may not be as active in seeking university partnerships.[130] Thus, firms in a cluster may be completely unaware of research being done at universities or government labs or not know where to find the most suitable talent, especially when the talent is recent graduates that have not yet been hired by a firm in the area.[131]

When the information asymmetry is contained within a jurisdiction, it may be a problem for the regional government, not the national government, to solve. Again, according to the salubrious view of localism and interjurisdictional competition discussed in Part II, they should be left in charge to the extent they have better incentives and more information.[132]

But the other kind of information asymmetry is *inter*jurisdictional, where firms *outside* the cluster lack key information that leads them to forego an opportunity that would be in the mutual interest of the firm and the cluster.[133] Selecting the optimal location requires significant information about local markets, transportation costs, labor markets, utilities needs, real estate requirements, regulatory environment, and other factors that contribute to the success of a company.[134] Local officials may have important information about any of these factors, especially when cutting-edge technological developments, shifts in local labor markets, or changes in local resources are involved.

5. Regional Inequality

A final result of regional cluster competition that might provide a basis for national intervention is regional inequality. Even if a natural

producing signals of one firm's activity to other potential partners. Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1499–1502 (2005).

[130] The University of Pennsylvania and Stanford have close relationships with private firms and are willing to work with them, but other universities where RSH has helped match companies with locations are not as open to commercialization and have very little connection with private companies in the area. *See* Interview with the Principal at RSH Consulting, *supra* note 126.

[131] On the importance of the flow of graduate students to surrounding firms in regions with UC campuses, see Martin Kenney, David Mowery & Donald Patton, *Electrical Engineering and Computer Science at UC Berkeley and in the Silicon Valley: Modes of Regional Engagement*, *in* PUBLIC UNIVERSITIES AND REGIONAL GROWTH: INSIGHTS FROM THE UNIVERSITY OF CALIFORNIA 97 (Martin Kenney & David C. Mowery eds., 2014); *see also* Camilla A. Hrdy, *Kenney & Mowery: Public Universities and Regional Growth*, WRITTEN DESCRIPTION (Oct. 14, 2014), http://writtendescription.blogspot.com/2014/10/kenney-mowery-public-universities-and.html.

[132] COOTER, *supra* note 14, at 106.

[133] *See* Gillette, *supra* note 14, at 451.

[134] Interview with the Principal at RSH Consulting, *supra* note 126.

cluster competition leads to an efficient allocation of resources, these resources may be allocated very unequally across regions in the United States.

In his research, Moretti has concluded that America's innovation cluster map is indeed uneven. "At one end of the spectrum," he writes, "are the brain hubs, with highly skilled and highly productive workers earning high wages. At the other end are cities whose workers have limited skills, low productivity, and falling wages."[135] Moretti concedes that this result might be the most efficient allocation of resources. Despite inequities among regions, "[f]or the United States as a whole," clustering is positive because "[i]t means that America's innovation sector is to some extent protected from foreign competition . . . [giving] it an undeniable advantage over Europe, China, and India."[136]

However, it is also possible that this distribution is more the result of happenstance than efficiency. According to some economists who focus on economic geography like Krugman, historical contingency followed by the "locking in" effects explains many of the success stories of history, such as manufacturing in the Rust Belt, cars in Detroit, or computer chips in Silicon Valley.[137] On this view, once a region has a lead-time advantage, this can result in increasing returns that make transitory advantages last for decades, or even centuries, to come.[138] Although he is skeptical of cluster theory generally, Gilles Duranton has also noted that a major barrier to entry for new clusters is risk aversion: once dominant clusters are in place, no one wants to go to not-yet-proven clusters or risk leaving the dominant one.[139] A counterintuitive result of this, Duranton writes, is that "[a]ll existing clusters in a given activity may be too big."[140] On the flip side, because some clusters are too big, *others are too small.*

From the Schumpeterian perspective, this locational monopoly, whether obtained through happenstance or true merit, might simply be seen as a cluster's just return for innovating before others—its "entrepreneurial profit."[141] Assuming the cluster is now vulnerable to the forces

[135] MORETTI, *supra* note 24, at 146.

[136] *Id.* at 147–48.

[137] KRUGMAN, *supra* note 51, at 10.

[138] MILLS ET AL., *supra* note 5, at 12; *see also* Porter, *supra* note 1, at 84 ("Once a cluster begins to form, a self-reinforcing cycle promotes its growth, especially when local institutions are supportive and local competition is vigorous. As the cluster expands, so does its influence with government and with public and private institutions.").

[139] As Duranton writes, "no-one wants to move alone and develop a new cluster because it would mean forming a very small and thus very unproductive cluster." Duranton, *supra* note 1, at 15–16.

[140] *Id.* at 15.

[141] JOSEPH A. SCHUMPETER, THE THEORY OF ECONOMIC DEVELOPMENT 128–37 (Redvers Opie, trans., Transaction Books 1983) (1934).

of creative destruction stemming from other regions, it should be free to enjoy its term of prosperity.

But this view may not lead to a level of regional equality we are comfortable with. Given that the United States is a single country, it might seem distasteful to have it be divided between "innovator" and "noninnovator" regions. Thus, national policymakers may decide to step in to ensure that clusters develop in all regions, not just the ones with the most resources at present, or the ones that benefited from historical contingency.

III. THE NEW NATIONAL CLUSTER COMPETITION

The America COMPETES Act of 2010 established the regional innovation program (RIP) "to encourage and support the development of regional innovation strategies, including regional innovation clusters . . . ."[142] The RIP is operated by the EDA in the Department of Commerce in coordination with other agencies like the DOE.[143] Congress authorized $100 million per year to be appropriated over the next three years (2011 to 2013) in order to carry out the program.[144] The EDA received $50 million in 2010 alone to support the creation of regional innovation clusters throughout the country.[145]

The RIP has two key pieces: the regional cluster grants, and a "regional innovation research and information program" (RIRIP), which establishes a program to collect data on regional innovation clusters in the United States and make that data available to other regions, agencies, and institutions involved in creating clusters.

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[142] *See supra* note 8 and accompanying text.

[143] The other major regional innovation competition authorized by the America COMPETES Act and operated by the EDA is the i6 Challenge, a multi-agency grant competition for "impactful national models for startup creation, innovation, and commercialization." *See* Press Release, Econ. Dev. Admin, U.S. Department of Commerce Announces $15 Million Grant Competition to Spur Regional Innovation (Sept. 4, 2014), http://www.eda.gov/news/press-releases/2014/09/04/regional-innovation-grant.htm. For more information on the America COMPETES Act's RIPs from the EDA, *see* http://www.eda.gov/oie/2014-risp-competition.htm.

[144] 15 U.S.C. § 3722(i) (2012). This and other provisions have been renumbered by 2015 Appropriations, *supra* note 8. Citations are to the 2012 version unless otherwise noted. In 2014, Congress lowered the funding to $10 million per year from fiscal years 2015 to 2019. *See id.*, *supra* note 8. For funding updates on the 2007 America COMPETES Act and the America COMPETES Reauthorization Act of 2010, see HEATHER B. GONZALEZ, CONG. RESEARCH SERV., R42779, AMERICA COMPETES ACTS: FY2008 TO FY2013 FUNDING TABLES 8 (2014).

[145] Ron Feinberg, *Cluster Spending Exceeds Obama's Goal*, POLITIFACT (Apr. 27, 2012), http://www.politifact.com/truth-o-meter/promises/obameter/promise/309/support-regional-innovation-clusters/.

A. Cluster Grants

The RIP authorizes "cluster grants" to be awarded by federal research agencies on a competitive basis to states, cities, and nonprofit institutions—like universities and research labs—that submit winning proposals for undertaking a variety of activities to promote the development of regional innovation clusters.[146] The statute defines a cluster as a "geographically bounded network of similar, synergistic, or complementary entities that are engaged in or with a particular industry sector and its related sectors;" "have active channels for business transactions and communication;" "share specialized infrastructure, labor markets, and services" and "leverage the region's unique competitive strengths to stimulate innovation and create jobs."[147] Permissible activities on which the grants can be spent include feasibility studies, programs to strengthen collaboration between cluster participants, "[a]ttracting additional participants" to the cluster, and facilitating market development of technology by the cluster.[148] The cluster grants have no monetary limit but come with a strict 50% matching requirement.[149]

The major selection criteria for the cluster grants are: whether the cluster is supported by the private sector and state and local governments or other relevant stakeholders and is likely to be able to attract additional funds; whether the cluster contains or has access to a well-trained workforce; whether existing participants will be likely to "encourage and solicit" participation from others that might benefit; the extent to which the cluster is likely to "stimulate innovation and have a positive impact on regional economic growth and development"; and the likelihood the cluster will be able to "sustain activities" once federal funds end.[150] In addition, the statute states that the deciding agency "shall give special consideration to applications from regions that contain communities *negatively impacted by trade*."[151]

Eligible recipients of grants and loans are states, Indian tribes, cities and other political subdivisions of states, nonprofits, universities, public-private partnerships, science research parks, federal labs, economic development organizations, or consortiums composed of any of those entities.[152]

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[146] 15 U.S.C. § 3722(b).

[147] *Id.* § 3722(h)(1).

[148] *See id.* § 3722(b)(2).

[149] *Id.* § 3722(b)(6) ("The Secretary may not provide more than 50 percent of the total cost of any activity funded under this subsection.").

[150] *Id.* § 3722(b)(4)(B) (listing minimum components of an application).

[151] *Id.* § 3722(b)(4)(C) (emphasis added).

[152] *Id.* § 3722(b)(3).

B. Information Collection and Dissemination

In addition to grants, the America COMPETES Act also creates a regional innovation research and information program (RIRIP).[153] RIRIP's primary purpose is to require grant recipients to gather, analyze, and disseminate information on best practices for regional innovation strategies; create guides for implementing those strategies; develop "relevant metrics and measurement standards" for evaluating regional innovation strategies' efficacy at stimulating "innovation, productivity, and economic development"; and to collect and disseminate information about the size, specialization, and competitiveness of particular regional innovation clusters, their supply chain product and service flows within and between clusters, and their outputs in the form of, for instance, regional domestic product contributions, total jobs and earnings generated in key occupations, and numbers of patents produced by researchers in the cluster.[154]

C. The Efficient Energy Buildings Cluster—Philadelphia, Pennsylvania

The largest cluster grant to date has gone to the greater Philadelphia area, which received over $159 million in federal and matched funds to build an Energy Efficient Buildings (EEB) cluster to investigate ways to make buildings more energy efficient.[155] The cluster is located at the Philadelphia Navy Yard and administered by the DOE and seven other federal agencies, in conjunction with Penn State University, industry representatives, and academics from across the region.[156] According to President Obama, not only will the project derive innovative ways to make homes and businesses consume less energy, but "[t]he discoveries made [in the cluster] will [also] lead to jobs in engineering, manufacturing, construction, installation and retail."[157]

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[153] *Id.* § 3722(e).

[154] *Id.* § 3722(e)(1)(A)–(D); *Id.* § 3722(e)(3) (stating that data collected will be made available to other federal agencies, state and local governments, and nonprofit and for-profit entities).

[155] Interview with Mark Alan Hughes, Professor of Practice at Penn Design, Faculty Director of the Kleinman Center for Energy Policy and a Lead Investigator at the DOE's Energy Efficient Buildings Hub at the Philadelphia Navy Yard (Nov. 11, 2015). Prof. Hughes drafted the Policy Markets Behavior component of the winning $159 million EEB Hub proposal to DOE and seven other federal agencies, and he directed PMB research for the Hub's first two years.

[156] *See Penn State Receives $122 Million for U.S. DOE Energy Innovation HUB*, OFF. VICE PRESIDENT FOR RESEARCH PENN ST. (Dec. 14, 2010), http://www.research.psu.edu/industry/11-29-12-archive-information-for-industry/theiron/fall-2010/doe-energy-innovation-hub.

[157] *Obama: Penn State Poised to Help U.S. 'Win the Future'*, OFF. VICE PRESIDENT FOR RESEARCH PENN ST. (Feb. 3, 2011), http://www.research.psu.edu/news/2011/obama-visits-penn-state.

The project has so far resulted in several publications based on experiments and findings, such as identifying better ways to retrofit buildings for energy efficiency, difficulties and inconsistencies in current ways for measuring buildings' energy efficiency, and suggestions for improvements.[158] That said, results at the Philadelphia cluster have been mixed. According to some people involved in the project, there have been administrative delays and arguments over direction, such as whether the project should generate wealth for the region or focus mainly on generating good science, and how engaged the project should be in promoting commercialization of efficient energy building strategies along with basic research.[159] These uncertainties have resulted in the hub being redubbed a "consortium" to indicate its more limited focus and expected regional impact.[160]

IV. MANAGED CLUSTER COMPETITION

Part II addressed the problems associated with regional cluster competition from the national perspective. In short, regional cluster competition implicates five pathologies that potentially warrant federal intervention. The first is positive externalities: clusters cannot internalize the benefits of innovations generated in the cluster or of their innovation policies. The second is secrecy: clusters may have a tendency to keep innovations secret in order to prevent copying by other regions. The third is rent-dissipating racing: in attempting to boost innovation in a particular cluster through public expenditures in the form of tax breaks or subsidies, governments might overspend or engage in duplicative investments from the national perspective. The fourth is lack of information: individual clusters lack key information about activities in other regions and the full state of cluster output and input markets; private firms lack information about where to locate their business. The fifth is regional inequality: natural cluster competition could result in a highly unequal distribution of innovation economies across the country.

This Part addresses the case for *managed* cluster competition: cluster competition in which federal laws and institutions play a role in promoting efficient and fair cluster development. They can do so by creating positive incentives for regional governments to grow clusters (carrots); by placing barriers on what regional governments can do (sticks);

[158] For a list of recent publications, see *Research and Publications*, CONSORTIUM FOR BUILDING ENERGY INNOVATION, http://cbei.psu.edu/category/integrated-design/.

[159] Interview with Mark Alan Hughes, *supra* note 155.

[160] For a recent update, see *Consortium for Building Energy Innovation Launches New Name, New Website*, [AIR CONDITIONING, HEATING & REFRIGERATION] NEWS (May 26, 2014), http://www.achrnews.com/articles/126734-may-29-2014-consortium-for-building-energy-innovation-introduces-new-name-new-website. For a discussion of the EEB's problems, see Editorial, *Renewed Energy*, NATURE, June 5, 2014, at 7.

or by mandating minimum levels of innovation or required disclosures of information. Below, I identify four distinct forms of cluster competition management: a national cluster grant competition like the Obama administration adopted in the America COMPETES Act, exclusive rights, innovation and disclosure mandates, and preemption.

A. Cluster Grant Competitions—The Carrot

The management solution advocated by scholars at the Brookings Institute and recently adopted by the Obama administration is a national competition in which states and other regional subdivisions compete for federal funding to grow clusters.[161] As explained in Part III, the RIP contains two key pieces: cluster grants for winning proposals, and information collection and dissemination. Here, I summarize how the program responds to pathologies afflicting cluster development.

Externalities. The COMPETES Act seems largely directed at second-order innovation: regional governments' experiments in law and policy.[162] In theory, monetary awards should boost local governments' incentives to innovate in designing cluster strategies and producing experiments about the efficacy of certain kinds of clusters. The cluster grants could also indirectly support first-order innovation in the area by creating a certification effect that increases researchers' ability to raise funding or by increasing absorption capacity for the research.

Secrecy and information gaps. The program's information collection and dissemination provisions should lead to more disclosure and sharing of information than would otherwise occur.[163] This increases local governments' access to information regarding clusters tremendously.[164]

Rent dissipation. By selecting winners early in the process, the competition could, on one hand, reduce duplicative, nationally wasteful spending on innovation clusters. On the other hand, as discussed below, this could have the opposite effect. Rather than reducing wasteful aspects

[161] This choice tracks the Obama administration's increasing adoption of prizes and other challenges to spur innovation. *See* OFFICE OF SCI. & TECH. POLICY, EXEC. OFFICE OF THE PRESIDENT, IMPLEMENTATION OF FEDERAL PRIZE AUTHORITY: FISCAL YEAR 2012 PROGRESS REPORT (2013).

[162] 15 U.S.C. § 3722 (2012).

[163] Regional governments' lack of information is one of the major justifications given for developing a federal cluster program. *See* MILLS ET AL., *supra* note 5, at 31 (noting the need for national information regarding geography of clusters and markets).

[164] This is coming to pass. The EDA, in conjunction with Michael Porter's research group—the Harvard Business School's Institute for Strategy and Competitiveness—has created an online cluster map with data about different clusters across the U.S. *Mapping a Nation of Regional Clusters*, U.S. CLUSTER MAPPING, http://www.clustermapping.us/.

of racing, it may simply end up increasing the competition by giving states a new incentive to compete: the opportunity for federal money.

Regional inequality. Lastly, the competitive grant program can address inequality among regions, at least at the margins. Statutory selection criteria allow the award-granting agency to pay attention to geographic disparity in selecting award winners. The statute states that in awarding grants the agency "shall give special consideration to applications from regions that contain communities negatively impacted by trade."[165]

B. Exclusive Rights (i.e. Cluster Patents)—The Carrot Not Chosen

Significant IP literature has discussed ways in which exclusive rights, such as patents for new inventions, can be used to effectively manage investment in innovation in cases where firms are racing to innovate, without requiring significant action from government officials or courts in defining the scope of the reward.[166]

A well-known example is Edmund Kitch's "prospect theory."[167] Making an analogy to mineral rights prospects, Kitch asserted that, especially when granted broadly and early in development, patents "manage" the search for technological information by granting development rights to a single owner who can then coordinate the direction of research and exchange information with others more efficiently than if all were working competitively in secret.[168] At the same time, patents avoid wasteful duplication of research efforts by signaling to others in the field that the invention is being developed and to stop work in that area or coordinate with the patent owner.[169]

The market failures implicated by innovation clusters—especially positive externalities, rent-dissipating races, and a tendency toward secrecy—resemble those implicated by innovations in private firms. In theory,

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[165] 15 U.S.C. § 3722(b)(4)(C) (2012).

[166] *See, e.g.*, Michael Abramowicz, *The Uneasy Case for Patent Races over Auctions*, 60 STAN. L. REV. 803 (2007) (comparing the virtues of prospective auctions of patent rights to inventions by the government with systems that grant patent rights to private actors that meet the standards of patentability); John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 443–46, 465–75 (2004) (arguing that early patenting and competition to get those patents is efficient because it will lead to inventions being placed in the public domain sooner).

[167] *See* Kitch, *supra* note 20, at 266–71.

[168] *Id.* at 276 ("[A patent] puts the patent owner in a position to coordinate the search for technological and market enhancement of the patent's value so that duplicative investments are not made and so that information is exchanged among the searchers."); *see also id.* at 285–86 (suggesting that efficiency of unification of control and pioneer patents allow a more efficient research strategy).

[169] *Id.* at 278 (arguing that patents lead to less wasteful duplication of effort via signaling). "[A] patent system enables firms to signal each other, thus reducing the amount of duplicative investment in innovation." *Id.*

rather than offering monetary awards for winning cluster proposals, the government could grant exclusive rights to particular clusters to last for a limited period in order to manage these costs.

Such exclusive rights could be designed in various ways. One way, similar to the patent system, would be to use a strict priority rule that gives the rights to the first region to submit a cluster proposal that meets baseline criteria of novelty, inventiveness, and utility, and that discloses sufficient information to permit others to replicate the cluster.[170]

For example, take the case of Philadelphia's award-winning EEB cluster. The City of Philadelphia and other relevant interest groups (the state, Penn State University, etc.) could submit a proposal to one or more reviewing agencies containing a sufficiently detailed specification describing how to develop an efficient-energy buildings cluster in the region. If this is the first proposal along those lines and seems sufficiently new and likely to work, the agency would give the region the exclusive right to host an EEB cluster within the United States, to last two to three years, perhaps with a possibility of extension. The winning cluster would also have to disclose a significant amount of information, both in its initial disclosure and over the course of its experimentation in growing the cluster. This could include both scientific information, such as results of EEB experiments; and economic information, such as effects on jobs, tax revenues, and business investing in the region. Other regions seeking to grow EEB clusters would be free to copy the plan and the results of Philadelphia's experiments, but only once the right has expired. They would also be able to obtain permission or a license from Philadelphia to host an infringing EEB cluster during the term of exclusivity.

Offering exclusive rights for clusters would alleviate the difficulty of government selecting among different regions with limited information and determining the size of the reward.[171] In addition, it would encourage disclosure of cluster strategies and results, and a variety of other information that might otherwise be kept secret in the absence of an exclusive right. In theory, granting rights early based on priority should decrease at least some of the costs of racing, by coordinating the efforts of different regions around fixed rights.[172]

On the other hand, this option would also generate costs of creating exclusive rights. Some regions that might otherwise be able to host an EEB cluster under some other system can no longer do so, and society would lose the benefits that might have accrued from those clusters. There may be less innovation in perfecting the operation of EEB clusters,

[170] These are the main patentability standards. 35 U.S.C. §§ 101, 102, 103, 112 (2012).

[171] In the Philadelphia case, for instance, many have complained that $159 million was a very large sum of money that is unlikely to be used in the most efficient way, and that this grant was too big. Interview with Mark Alan Hughes, *supra* note 155.

[172] *See* Kitch, *supra* note 20 at 266, 269, 276, 283–85.

since other regions would not be able to build on Philadelphia's results to perform experiments in their own regions, at least for the term of the right.

There are ways to reduce these costs. For example, the government could implement compulsory licensing in order to avoid the costs of lost innovation in other regions. Another option is to require more stringent proof that the winning cluster actually needs an exclusive right as an incentive. For example, the government could require a region seeking an exclusive right to put up a bond as a guarantee of need.[173] This would at least reduce the risk of government granting a "cluster patent" where the exclusive right is entirely unnecessary.

Another downside of exclusive rights is that this might lead regions to spend too much or engage in duplicative investments on clusters in the race to win cluster rights first. Indeed, a common response to Kitch's "prospect theory" is that rather than reducing duplicative investments in technology, the option for a patent may intensify the race to capture the patent, leading to *more* rather than less wasteful spending.[174]

To reduce the additional racing costs of a priority-based system, an alternative iteration of exclusive rights could be to use an auction.[175] Here, the government would decide up front which clusters ought to be developed: for instance, one EEB cluster, one solar energy cluster, one car battery cluster, two advanced manufacturing clusters, three IT clusters, seven biotech clusters, and so on. Then, the government would auction off the exclusive rights to different regions to develop these clusters. In the simplest iteration of the auction, the government would give rights to develop each cluster to the highest bidders.[176]

Although the auction option would achieve the benefits of rewarding innovation and increasing disclosure, and would avoid the additional racing costs generated by a priority-based system, it would also create a significant additional administrative burden on the government and would require government to have very good information about which types of clusters should be developed up front.[177]

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[173] Michael Abramowicz, *Orphan Business Models: Toward a New Form of Intellectual Property*, 124 HARV. L. REV. 1362, 1408–19 (2011) (describing a bonding mechanism requiring a company seeking a patent on a business model to prove they need an exclusive right by putting up a bond to back up the applicant's claim that the business model won't be attempted if the application is refused).

[174] *See* Duffy, *supra* note 166, at 442, 444 (arguing that the race to be first results in earlier patenting and therefore dedicates the invention to the public sooner).

[175] *See* Abramowicz, *supra* note 166, at 844–60 (comparing patent auctions to usual priority based systems).

[176] There might be more efficient ways to design the auction. *See id.* (discussing various options for designing patent auctions).

[177] *Id.* at 834–44 (discussing costs of government-administered patent auctions).

C. Preemption—The Stick

As alluded to, the patent law literature teaches us that creating "carrots" like patent rights—though they are politically popular for obvious reasons[178]—may exacerbate rather than reduce spending on innovation. The same may be true under the new RIP: regions may engage in more rather than less wasteful spending on innovation due to the prospect of federal subsidies. For instance, all states wishing to grow a biotech cluster, aware of the possibility of federal matching grants if successful, might be tempted to overspend on incentives directed at biotech firms. Given that there can only realistically be a limited number of biotech clusters in the United States, this supranormal spending on biotech is likely to lead to some wasted government money that could have gone to other crucial public functions, like basic infrastructure.

A potential solution to this problem is to ensure that the carrots in the COMPETES Act are accompanied by the possibility of preemption, either by courts or by statute, in order to reduce wasteful spending induced by the new program. Specifically, it would be efficient to preempt a local innovation incentive whose expected value to a local jurisdiction is far less than the overall losses to other jurisdictions, minus any national benefits created from new innovations that we would not otherwise have.[179] This would not create positive incentives to build clusters. Indeed, it would often do the opposite: prohibit local spending on cluster development. But, when combined with positive incentives like rewards or exclusivity, preemption could be useful for restraining some of the most worrisome forms of local innovation incentives, such as those that do not seem to be resolving any market failure or that simply shift activity from one place to another.[180]

That said, the legal basis for preemption in this context is uncertain. The general rule is that U.S. states have concurrent powers to tax and spend for the benefit of their regional economies.[181] States' concurrent authority is subject to the limits of federal preemption.[182] But courts

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[178] *See* Brian Galle, *The Tragedy of the Carrots: Economics and Politics in the Choice of Price Instruments*, 64 STAN. L. REV. 797, 840–45 (2012) (observing that governments may prefer carrots to sticks for political economy reasons).

[179] *See* Camilla A. Hrdy, *State Patents as a Solution to Underinvestment in Innovation*, 62 U. KAN. L. REV. 487, 537–47 (2013) (developing a Dormant Commerce Clause doctrine for state patents for innovative subject matter).

[180] *See* Gillette, *supra* note 14, at 499–500 (arguing location incentives should not be prohibited by the Dormant Commerce Clause "if, as a whole, they tend to induce firms to locate in jurisdictions that permit greater productivity than the same firms would achieve in other jurisdictions").

[181] *See* U.S. CONST. amend. X; *see also* THE FEDERALIST NO. 32 (Alexander Hamilton) (explaining that states possess "the like authority . . . to lay and collect taxes[.]").

[182] Elton Richter, *Exclusive and Concurrent Powers in the Federal Constitution*, 4

in recent cases have not responded favorably to challenges to state subsidies and tax credits. Below I discuss several ways to effectuate preemption and the legal landscape for each.

1. Judicially Mediated Preemption

Oddly, modern patent preemption doctrine takes no stance on state tax credits or subsidies for innovating, despite the potentially quite significant effects on levels of patenting and patent commercialization.[183] Instead, it is the Commerce Clause that provides the most robust framework for addressing the potential costs of state subsidies and tax credits for research and commercialization.[184]

The basic Dormant Commerce Clause analysis requires courts to strike down state laws that facially discriminate against out-of-state entities as well as facially neutral state laws that have adverse effects on interstate commerce.[185] Under the most common variant, the *Pike* test, "[w]here the statute regulates even-handedly to effectuate a legitimate local public interest, and its effects on interstate commerce are only incidental, it will be upheld unless the burden imposed on such commerce is clearly excessive in relation to the putative local benefits."[186]

NOTRE DAME LAW. 513, 519–20 (1929).

[183] *See* Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 160–61 (1989) (observing that state laws that protect unpatentable subject matter might lead to less investment in patentable innovation).

[184] *See generally* Walter Hellerstein & Dan T. Coenen, *Commerce Clause Restraints on State Business Development Incentives*, 81 CORNELL L. REV. 789 (1996). Other potential constitutional restrictions include the Privileges and Immunities Clause, U.S. CONST. art. IV, § 2, cl. 1, and the Equal Protection Clause, U.S. CONST. amend. XIV. *See also* Metropolitan Life Insurance Co. v. Ward, 470 U.S. 869, 871, 882–83 (1985) (striking down an Alabama tax scheme that imposed "a substantially lower gross premiums tax rate on [domestic companies] than on out-of-state (foreign) companies"); Township of Hillsborough v. Cromwell, 326 U.S. 620, 623 (1946) ("The equal protection clause of the Fourteenth Amendment protects the individual from state action which selects him out for discriminatory treatment by subjecting him to taxes not imposed on others of the same class."). However, the Privileges and Immunities Clause cannot be raised by corporations, which are not considered "citizens" under the Privileges and Immunities Clause. Hemphill v. Orloff, 277 U.S. 537, 548–50 (1928). The Equal Protection challenge is similar to the Dormant Commerce Clause challenge but much weaker because courts apply "rational basis review," under which a classification (e.g., in-state versus out-of-state resident) "must be upheld against equal protection challenge if there is any reasonably conceivable state of facts that could provide a rational basis for the classification." Am. Ass'n of Univ. Professors v. Cent. State Univ., 717 N.E.2d 286, 289–90 (Ohio 1999).

[185] For discussion of the various balancing tests federal courts use in Dormant Commerce Clause cases, see BORIS I. BITTKER, BITTKER ON THE REGULATION OF INTERSTATE AND FOREIGN COMMERCE § 6.05 (1999).

[186] Pike v. Bruce Church, Inc., 397 U.S. 137, 142 (1970). *See also* Donald H. Regan, *The Supreme Court and State Protectionism: Making Sense of the Dormant Commerce Clause*, 84 MICH. L. REV. 1091, 1207 (1986).

Several commentators have recognized that the Dormant Commerce Clause may preempt innovation incentives such as state R&D tax credits. For example, Daniel Wilson and Kirk Stark have argued that state R&D tax incentives that merely shift the location of activity from one state to another should be found unconstitutional under the Dormant Commerce Clause because they produce "negative externalities" for other states that lose residents.[187] This argument may well have worked under the Sixth Circuit's holding in *Cuno v. DaimlerChrysler, Inc.*, which struck down an Ohio tax credit scheme that allowed businesses to receive credit against the state franchise tax for qualifying investments in new machinery and equipment within the state.[188] However, the Supreme Court overturned the Sixth Circuit's decision, holding that the plaintiffs (state taxpayers) lacked Article III standing because their injury was too "conjectural or hypothetical" and not redressable.[189]

Another limitation is the "market participant" exception to the Dormant Commerce Clause. The market participant exception shields states and local governments from liability for otherwise discriminatory activity when acting as a producer or supplier of a marketable good or service.[190] In theory, local incentives for R&D and, especially, for *new* companies that did not previously exist, should arguably be treated more deferentially under this doctrine, despite negative consequences for other jurisdictions. As Walter Hellerstein and Dan Coenen have noted, when the state subsidizes something new, it resembles a "purchaser" of a valua-

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[187] *See* Kirk J. Stark & Daniel J. Wilson, *What Do We Know About the* Interstate *Economic Effects of State Tax Incentives?*, 4 GEO. J.L. & PUB. POL'Y 133, 150, 156–57, 163 (2006); *see also, e.g.*, Enrich, *supra* note 26, at 384–86 (listing R&D tax incentives as one of the state business incentives that Enrich believes should be prohibited under the Commerce Clause); Brent B. Nicholson & Sue Mota, *The Dormant Commerce Clause Rises Again:* Cuno v. Daimler Chrysler, 5 HOUS. BUS. & TAX. L.J. 322 (2005) (addressing Dormant Commerce Clause treatment of states' increasing use of location incentives generally).

[188] Cuno v. DaimlerChrysler, Inc., 386 F.3d 738, 743–46, 750 (6th Cir. 2004).

[189] *See* DaimlerChrysler Corp. v. Cuno, 547 U.S. 332, 344–47 (2006); *see also* Jonathan Edwards, Casenote, DaimlerChrysler v. Cuno*: The Supreme Court Hits the Brakes on Determining the Constitutionality of Investment Incentives Given by States to Corporate America*, 58 MERCER L. REV. 1411, 1420–22 (2007).

[190] Reeves, Inc. v. Stake, 447 U.S. 429, 440 (1980) (upholding South Dakota's right to give South Dakota residents preferential treatment in the purchase of cement produced at a cement plant owned and operated by the state). The market participant exception is also recognized by the state action doctrine in antitrust law. *See* David McGowan & Mark Lemley, *Antitrust Immunity: State Action and Federalism, Petitioning, and the First Amendment*, 17 HARV. J. PUB. POL'Y 293, 320–21 (1994) ("The state action doctrine protects both governments and the private enterprises that lobby them from [antitrust] liability for anticompetitive government conduct, without regard to the consequences for competition or the legitimate concerns of the antitrust laws.").

ble asset, potentially triggering the market participant exception.[191] Thus, even if the Supreme Court's standing doctrine is relaxed, local incentives for innovation may be treated differently from other kinds of state tax incentives and subsidies.[192]

2. Legislative Preemption

If judicial preemption proves to have no teeth, Congress could potentially expressly preempt state and regional governments from creating incentives in egregious cases—for instance, when a state incentive is expressly designed to lure innovators from other jurisdictions that already have a cluster in the relevant area. Some commentators have recommended this option for state and city subsidies. For example, according to a recent Council on Foreign Relations (CFR) memorandum, the United States should more strictly enforce against state and local governments World Trade Organization (WTO) rules that restrict certain kinds of subsidies and require signatories to report all subsidies.[193] The Obama administration has also targeted state and city subsidies, or at least those of a certain kind. The administration's 2016 budget, presented to Congress in February 2015, calls for barring the use of tax-exempt bonds to finance professional sports facilities.[194]

That said, complete legislative preemption would be constitutionally suspect under the Tenth Amendment and is likely to be challenged.[195] Moreover, a broad ban on state and local spending for innovation would be only a second-best option as a policy matter. The goal

[191] *See* discussion in Hellerstein & Coenen, *supra* note 184, at 850–52. They also argue incentives for new companies are easier to justify because when states act to foster "entirely new business operations" the state appears to be operating "more like a 'laboratory' of local inventiveness" "that our constitutional tradition of federalism celebrates." Moreover, "when a state considers the possibility of new business subsidies, ordinary political processes should provide greater safeguards against ill-advised and parochial decisionmaking" because newcomers are unlikely to possess the political influence of incumbents. *Id.* at 851.

[192] *Cf.* Enrich, *supra* note 26, at 384 (grouping R&D tax incentives together with investment tax credits).

[193] Notably, the language distinguishes targeted subsidies for certain companies or industries, which can be challenged by other countries, from broad tax cuts or other forms of government support like R&D spending, which are permitted. *See* Edward Alden & Rebecca Strauss, *How to End State Subsidies*, N.Y. TIMES (May 10, 2014), http://nyti.ms/1hDqZrx. For the full CFR report, *see* Memorandum, Edward Alden & Rebecca Strauss, *Curtailing the Subsidy War Within the United States*, COUNCIL ON FOREIGN REL. (May 12, 2014), http://www.cfr.org/united-states/curtailing-subsidy-war-within-united-states/p32762.

[194] OFFICE OF MGMT. & BUDGET, FISCAL YEAR 2016 ANALYTICAL PERSPECTIVES OF THE UNITED STATES GOVERNMENT 167 (2015), https://www.gpo.gov/fdsys/pkg/BUDGET-2016-PER/pdf/BUDGET-2016-PER.pdf.

[195] The general rule is that U.S. states have concurrent powers to tax and spend for the benefit of their regional economies. *See supra* note 181 and accompanying text.

should be to find a solution that sustains the benefits of local innovation incentives discussed in Part II, even as it limits the costs.

3. Voluntary Compacts

A final option is to do nothing and hope that states come to recognize the costs their actions impose on one another, and enter a voluntary agreement (a compact) to stop wasteful spending practices.[196] The CFR report just mentioned recommends that, if express preemption does not work, states should voluntarily agree to limit their spending on business subsidies.[197] This option requires less intervention from the federal government, but it assumes states can reach the degree of unanimity for the agreement to function effectively.[198] Given the size of the prize—a successful innovation cluster, a thriving local economy, and the possibility of federal subsideies—and local governments' strong incentives to capture it, I do not see the compact option working without further federal intervention.

D. Innovation and Disclosure Mandates

A different solution to the underinvestment problem is to mandate minimum levels of innovation for putative innovators. If the innovators fail to meet this minimum, they would be exposed to some penalty.[199] In the context of environmental regulation, for instance, the federal government commonly uses mandates, such as requiring states to cut pollution levels or to submit proposals for doing so.[200] For example, the Environmental Protection Agency (EPA) recently required each state to submit a plan detailing how it would cut coal-fired power plant pollution to meet the EPA's target levels, with the intent that these plans will eventually be implemented.[201]

The government could take a similar approach to the goal of cluster development as it takes to pollution reduction. Rather than creating rewards for winning cluster proposals and promising to collect and

[196] Cooter & Siegel, *supra* note 14, at 140. The compact would have to be approved by Congress. U.S. CONST. art. I, § 10, cl. 3 ("No State shall, without the Consent of Congress . . . enter into any Agreement or Compact with another State[.]").

[197] Alden & Strauss, *supra* note 193.

[198] *Id.*

[199] Ian Ayres & Amy Kapczynski, *Innovation Sticks: The Limited Case for Penalizing Failures to Innovate*, 82 U. CHI. L. REV. 1781, 1801–03 (2015); *see also* Julien Pénin, *Should We Oblige Firms to Invest in R&D? Knowledge Spillovers and the Market of 'Not to Invest in R&D Tradable Permits'* 3–4 (Univ. de Strasbourg, BETA, CNRS-UMR 7522, 2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2354283.

[200] *See generally* Jonathan S. Masur & Eric A. Posner, *Climate Regulation and the Limits of Cost–Benefit Analysis*, 99 CALIF. L. REV. 1557 (2011).

[201] Coral Davenport, *McConnell Urges States to Defy U.S. Plan to Cut Greenhouse Gas*, N.Y. TIMES (Mar. 4, 2015), http://nyti.ms/18RMk3a.

disseminate results to other states, the government could mandate that each state submit a cluster proposal for their region and detail how they will implement it, and then mandate implementation and disclosure of all results. This would not solve the problem of funding. Thus, to the extent that regions do not internalize the benefits of their policy experiments and require further incentives, the government might also promise subsidies to reward and assist implementation of proposals.

CONCLUSION

As a growing number of IP scholars have observed, one of the costs of using intellectual property rights to promote investment in innovation rather than innovation finance incentives like prizes is that, even when patents are effective at "pricing" information goods, they necessarily raise both efficiency and distributive justice challenges.[202] Just as IP law and theory can provide useful insights into how the government should approach the task of managing regional cluster competition, the government's evolving experiment in managing cluster competition through the use of *competitive grants* rather than exclusive rights can provide useful insights for IP law and theory.

As I have shown, not unlike property rights, grants can help to manage the wasteful or distasteful aspects of competition. Similar to the way the Patent Act gives inventors the opportunity to obtain exclusive rights in exchange for disclosure of new inventions, the America COMPETES Act gives regions the opportunity to win federal money in exchange for implementing and sharing information about their cluster strategies. In theory, this will encourage regions to disclose useful information and build clusters in areas where they have a real comparative advantage, rather than wasting money trying to be first in the same technology areas. In addition, the Act begins to tackle the problem of geographic inequality by giving preference to underdeveloped areas.

However, just as in the patent law case, this strategy could backfire, leading to more rather than less wasteful spending on innovation clusters, as regional interest groups begin to compete for the promise of federal funds. Therefore, the carrots provided in the America COMPETES Act may need to be accompanied by the stick of preemption. As shown in Part IV, current preemption options are limited. That said, as state spending on innovation clusters and economic development

[202] MADHAVI SUNDER, FROM GOODS TO A GOOD LIFE: INTELLECTUAL PROPERTY AND GLOBAL JUSTICE 29 (2012) ("A central failure of intellectual property as incentives is its neglect of distribution."); *see also* Amy Kapczynski, *The Cost of Price: Why and How to Get Beyond Intellectual Property Internalism*, 59 UCLA L. REV. 970, 1001–02 (2012) ("In distributive terms, the most promising of the alternatives or supplements to the price mechanism is the approach of government procurement.").

continues to increase, other regions and policymakers are starting to take notice.[203] As these concerns escalate, courts may become more active in putting brakes on their ability to spend freely to lure innovators into the jurisdiction, and the Supreme Court may decide this time to uphold these decisions.

[203] The *New York Times*, for instance, reported recently that states, cities, and counties gave up a combined $80.4 billion in incentives in 2012, hoping for long-term local economic benefits that never materialized. *See* Louise Story, *The Empty Promise of Tax Incentives: Governments Give up $80 Billion a Year, but Jobs Can Still Vanish*, N.Y. TIMES, Dec. 1, 2012, at A1.