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Complex Experimental Federalism

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INTRODUCTION

Ever since the argument made its Supreme Court debut in 1932,[1] scholars,[2] politicians,[3] and judges from across the

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1. New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting). While the central claim is usually attributed to Justice Brandeis, arguments for experimentalism date back to at least the late nineteenth and early twentieth centuries. *See* Truax v. Corrigan, 257 U.S. 312, 344 (1921) (Holmes, J., dissenting) (referencing states as "insulated chambers" that conduct "social experiments"); JAMES VISCOUNT BRYCE, 1 THE AMERICAN COMMONWEALTH 468 (1888) ("Federalism enables a people to try experiments in legislation and administration which could not be safely tried in a large centralized country. A comparatively small commonwealth like an American State easily makes and unmakes its laws; mistakes are not serious, for they are soon corrected; other States profit by the experience of a law or a method which has worked well or ill in the State that has tried it."); MICHAEL S. GREVE, THE UPSIDE-DOWN CONSTITUTION 253-54 (2012) (quoting Brandeis letter from 1912 endorsing state experimentation).

2. *See, e.g.*, Michael C. Dorf, *Foreword: The Limits of Socratic Deliberation*, 112 HARV. L. REV. 4, 60-61 (1998); Larry Kramer, *Understanding Federalism*, 47 VAND. L. REV. 1485, 1499 (1994); *see generally* Michael C. Dorf & Charles F. Sabel, *A Constitution of Democratic Experimentalism*, 98 COLUM. L. REV. 267 (1998).

3. *See, e.g.*, CQ Transcripts Wire, *Obama Remarks Before Meeting with Governors*, WASH. POST (Dec. 2, 2008, 12:08 PM), http://www.washingtonpost.com/wp-dyn/content/article/2008/12/02/AR2008120201486.html (President-elect

ideological spectrum[4] have celebrated federalism as a structure for policy experimentation and innovation. The idea, as Justice Louis Brandeis explained it, is that "courageous"[5] states will try out their own ways of solving policy problems. Then, as these policy laboratories experiment with different approaches, other states[6] and the federal government[7] can copy or improve upon the best solutions.

Obama praising the ability of a state to "serve as a laboratory experimenting with innovative solutions to our economic problems. . . . [T]hat's the spirit that I want to reclaim for the country as a whole. One where states are testing ideas, where Washington is investing in what works . . .").

4. *See* McDonald v. City of Chicago, 561 U.S. 742, 869, 902-03 (2010) (Stevens, J., dissenting); Oregon v. Ice, 555 U.S. 160, 170-71 (2009); Schaffer *ex rel.* Schaffer v. Weast, 546 U.S. 49, 71 (2005); Gonzales v. Raich, 545 U.S. 1, 42 (2005) (O'Connor, J., dissenting); Blakely v. Washington, 542 U.S. 296, 327 (2004) (Kennedy, J., dissenting); Boy Scouts of America v. Dale, 530 U.S. 640, 664 (2000) (Stevens, J., dissenting); Chandler v. Miller, 520 U.S. 305, 324 (1997) (Rehnquist, C.J., dissenting); U.S. v. Virginia, 518 U.S. 515, 600-01 (1996) (Scalia, J., dissenting); U.S. v. Lopez, 514 U.S. 549, 581 (1995) (Kennedy, J., concurring); Arizona v. Evans, 514 U.S. 1, 30 (1995) (Ginsburg, J., dissenting); West Lynn Creamery, Inc. v. Healy, 512 U.S. 186, 216-17 (1994) (Rehnquist, C.J., dissenting); Harmelin v. Michigan, 501 U.S. 957, 1008-09 (1991); Cruzan *ex rel.* Cruzan v. Dir., Mo. Dep't of Health, 497 U.S. 261, 292 (1990) (O'Connor, J., concurring); Garcia v. San Antonio Metro. Transit Auth., 469 U.S. 528, 546 (1985); Reeves, Inc. v. Stake, 447 U.S. 429, 441 (1980). Lower court judges have invoked Brandeis's theory as well. *See, e.g.*, Doe *ex rel.* Johnson v. S.C. Dep't of Soc. Servs., 597 F.3d 163, 187 (4th Cir. 2010) (Wilkinson, C.J., concurring) (substantive due process); Fields v. Prater, 566 F.3d 381, 389 (4th Cir. 2009) (First Amendment); Pharm. Research & Mfrs. of America v. Concannon, 249 F.3d 66, 85 (1st Cir. 2001) (dormant Commerce Clause); *see also* Ann Althouse, *Vanguard States, Laggard States: Federalism and Constitutional Rights*, 152 U. PA. L. REV. 1745, 1752-76 (2004).

5. New State Ice Co., 285 U.S. at 311 (Brandeis, J., dissenting).

6. *See, e.g.*, ANDREW KARCH, DEMOCRATIC LABORATORIES: POLICY DIFFUSION AMONG THE AMERICAN STATES (2007); Frances Stokes Berry & William D. Berry, *State Lottery Adoptions as Policy Innovations: An Event History Analysis*, 84 AM. POL. SCI. REV. 395 (1990).

7. *See* Keith Boeckelman, *The Influence of States on Federal Policy Adoptions*, 20 POL'Y STUD. J. 365 (1992); Earl M. Maltz, *The Impact of the Constitutional Revolution of 1937 on the Dormant Commerce Clause—A Case Study in the Decline of State Autonomy*, 19 HARV. J.L. & PUB. POL'Y 121, 127-28 (1995); Karen Mossberger, *State-Federal Diffusion and Policy Learning: From Enterprise Zones to Empowerment Zones*, 29 PUBLIUS: J. FEDERALISM 31 (1999); Carol S. Weissert & Daniel Scheller, *Learning from the States? Federalism and National Health*

The result, according to federalism's biggest fans, is a system that generates more efficient and effective policymaking than a single policy imposed from above by a centralized government.[8] They argue collective learning happens faster if fifty states are simultaneously trying to solve a problem; federalist systems acquire more information, process it faster, and offer conclusions that are collectively more accurate than a single experiment conducted by a centralized national government.[9] Moreover, federalist systems are better equipped to contain the risk of failed policy experiments, since the costs of policy failure are visited only upon the experimenting state rather than the nation as a whole.[10]

And yet, despite the enduring survival of this normative claim, constitutional theory has been surprisingly uninterested in the down and dirty mechanics of experimental federalism.[11] Instead, theorists have been

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Policy, 68 PUB. ADMIN. REV. S162 (2008). *But see* David Lowery et al., *Policy Attention in State and Nation: Is Anyone Listening to the Laboratories of Democracy?*, 41 PUBLIUS: J. FEDERALISM 286, 286 (2010) (finding "little evidence" that changes in state policy agendas influence national policy agendas).

8. *See* Akhil Reed Amar, *Five Views of Federalism: "Converse-1983" in Context*, 47 VAND. L. REV. 1229, 1233-36 (1994).

9. *See* Dorf, *supra* note 2, at 60-61; Benjamin K. Sovacool, *The Best of Both Worlds: Environmental Federalism and the Need for Federal Action on Renewable Energy and Climate Change*, 27 STAN. ENVTL. L.J. 397, 434-36 (2008).

10. *See* JENNA BEDNAR, THE ROBUST FEDERATION: PRINCIPLES OF DESIGN 31 (2009) [hereinafter BEDNAR, ROBUST FEDERATION]; Jenna Bednar, *Nudging Federalism Towards Productive Experimentation*, 21 REGIONAL & FED. STUD. 503 (2011) [hereinafter Bednar, *Nudging Federalism*]; Dorf, *supra* note 2, at 60. For other arguments supporting experimental federalism, see, e.g., DAVID L. SHAPIRO, FEDERALISM: A DIALOGUE 87-88 (1995); Michael W. McConnell, *Federalism: Evaluating the Founders' Design*, 54 U. CHI. L. REV. 1484, 1498 (1987), arguing that subsidiary policy-making units are more likely to have preferences that depart from the national mean, and are more likely to experiment with policies that a national majority would reject, and Lawrence G. Sager, *Cool Federalism and the Life-Cycle of Moral Progress*, 46 WM. & MARY L. REV. 1385, 1387-89 (2005); Ralph K. Winter, Jr., *State Law, Shareholder Protection, and the Theory of the Corporation*, 6 J. LEGAL STUD. 251, 276 (1977), arguing that federalism allows the legal system to harness the experimental benefits of competition.

11. *See* GREVE, *supra* note 1, at 195; Barry Friedman, *Valuing Federalism*, 82 MINN. L. REV. 317, 324 (1997). Indeed, the idea that federalism produces experimentation and innovation is not a foregone conclusion. *See* DANIEL

focused almost entirely on the relationship between experimentation and vertical federalism, preoccupied with whether the benefits from those experiments justify the cost and inefficiency that results from maintaining fifty state governments,[12] or whether a commitment to experimentalism has any real use in resolving difficult constitutional disputes about the scope of individual liberties or the allocation of power between federal and state governments.[13]

This Article engages experimental federalism from a different perspective, putting aside well-worn debates about whether "Our Federalism"[14] is really worth all the trouble. Whether we like it or not, federalism is here to stay as a core element of our constitutional system. The proper focus, as Robert Schapiro puts it, "is not 'why federalism,' but how federalism should best operate."[15] Indeed, the need to improve federalism's experimental capacity has taken on new relevance in an era marked by unprecedented political gridlock in Washington.[16] When federal inaction creates a policy vacuum, state policy experimentation may be the *only* available solution for solving difficult social problems.[17] Moreover, as political impasse removes the threat of any

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TREISMAN, THE ARCHITECTURE OF GOVERNMENT: RETHINKING POLITICAL DECENTRALIZATION 229-35 (2007); Hongbin Cai & Daniel Treisman, *Political Decentralization and Policy Experimentation*, 4 Q. J. POL. SCI. 35, 53 (2009).

12. *See* Edward L. Rubin & Malcolm Feeley, *Federalism: Some Notes on a National Neurosis*, 41 UCLA L. REV. 903, 924-26 (1994).

13. *See* BRYCE, *supra* note 1, at 165-68. For other critiques of experimental federalism, see Susan Rose-Ackerman, *Risk Taking and Reelection: Does Federalism Promote Innovation?*, 9 J. LEGAL STUD. 593 (1980).

14. Younger v. Harris, 401 U.S. 37, 44 (1971).

15. ROBERT A. SCHAPIRO, POLYPHONIC FEDERALISM: TOWARD THE PROTECTION OF FUNDAMENTAL RIGHTS 6 (2009); *see also* Hannah J. Wiseman, *Regulatory Islands*, 82 N.Y.U. L. REV. 1661, 1680 (2014) (arguing that regardless of whether experimentation is desirable, "states will continue experimenting, and we must make this experimentation as effective as possible.").

16. *See* J. Mitchell Pickerill & Cynthia J. Bowling, *Polarized Parties, Politics, and Policies: Fragmented Federalism in 2013-2014*, 44 PUBLIUS: J. FEDERALISM 369, 371-72 (2014).

17. *See* KARCH, *supra* note 6, at 15 (2007); S. Karthick Ramakrishnan & Pratheepan Gulasekaram, *The Importance of the Political in Immigration Federalism*, 44 ARIZ. ST. L.J. 1431, 1437-39 (2012).

organized federal response, state governments are steadily expanding their experimental sphere into areas that overlap with federal authority, like immigration and medical marijuana.[18]

This shift in approach brings a different set of questions to the forefront. A meaningful theory of how experimental federalism works seeks to identify the traits that allow decentralized systems to innovate effectively, asks whether our current system contains those traits, and recommends changes to existing constitutional structures and doctrine that would help our current system come closer to the ideal.[19] Given the inevitability of federalism as a core element of our constitutional order, how should we design constitutional institutions and doctrinal rules to help the system achieve its experimental potential? How can we structure an environment where states do interesting things,[20] and where those choices can benefit their citizens, other states, the nation, and the world? How can these design features help preserve federalism's experimental benefits regardless of federal or state budget constraints, the political climate, demographic shifts, or who is currently winning the debate over "states' rights" at any given moment?

This Article begins to address these questions by offering a framework for thinking about how experimental federalism works. It uses complex systems theory, an analytic lens that has started to gain some traction within constitutional scholarship over the last five years,[21] to examine how certain

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18. *See* Keith Cunningham-Parmeter, *Forced Federalism: States as Laboratories of Immigration Reform*, 62 HASTINGS L.J. 1673 (2011); Sam Kamin, *Cooperative Federalism and State Marijuana Regulation*, 85 U. COLO. L. REV. 1105, 1106-12 (2014); Pickerill & Bowling, *supra* note 16, at 369-72.

19. Dorf and Sabel come closest to this ideal, but only deal with federalism in a small portion of their work. *See* Dorf & Sabel, *supra* note 2, at 419-38.

20. *See* SCOTT E. PAGE, DIVERSITY AND COMPLEXITY 10 (2011) [hereinafter PAGE, DIVERSITY AND COMPLEXITY].

21. *See* ADRIAN VERMEULE, THE SYSTEM OF THE CONSTITUTION (2011); Jenna Bednar, *Subsidiarity and Robustness: Building the Adaptive Efficiency of Legal Systems*, *in* NOMOS LV: FEDERALISM AND SUBSIDIARITY 231 (James E. Fleming & Jacob T. Levy eds., 2014) [hereinafter Bednar, *Subsidiarity and Robustness*]; Jenna Bednar, *The Political Science of Federalism*, 7 ANN. REV. L. & SOC. SCI. 269 (2011) [hereinafter Bednar, *Political Science of Federalism*]; Doni Gewirtzman,

kinds of decentralized systems work and thrive. When systems are composed of many parts, those parts interact with one another and give the system traits that cannot be predicted simply by looking at the individual characteristics of the system's components.[22] For example, it is impossible to fully describe or predict behavior in our constitutional system simply by looking at a set of Supreme Court cases that interpret the Constitution. Instead, the system's traits are defined by countless interactions between executive, legislative, and judicial actors on the federal and state level operating within the constraints of different legal rules. Complex systems analysis is an effort to understand how those interactions work, and the "system-level" macroscopic behavior that they generate.[23]

Systems theory suggests that Brandeis's experimental vision for federalism depends heavily on two underexplored concepts in constitutional theory: heterogeneity and interdependence.[24] Heterogeneity refers to the extent to

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Lower Court Constitutionalism: Circuit Court Discretion in a Complex Adaptive System, 61 AM. U. L. REV. 457 (2012); Jenna Bednar, *Constitutional Systems Theory: A Research Agenda Motivated by Vermeule,* The System of the Constitution*, and Epstein,* Design for Liberty, 48 TULSA L. REV. 325 (2012) (book review); Garrick B. Pursley, *Properties in Constitutional Systems: Reviewing Adrian Vermeule,* The System of the Constitution, 92 N.C. L. REV. 547 (2014) (book review); *cf.* Barbara A. Cherry, *The Telecommunications Economy and Regulation as Coevolving Complex Adaptive Systems: Implications for Federalism*, 59 FED. COMM. L.J. 369 (2007); David G. Post & David R. Johnson, *"Chaos Prevailing on Every Continent": Towards a New Theory of Decentralized Decision-Making in Complex Systems*, 73 CHI.-KENT L. REV. 1055 (1998).

22. *See* J.B. Ruhl, *Managing Systemic Risk in Legal Systems*, 89 IND. L.J. 559, 567-68 (2014) [hereinafter Ruhl, *Managing Systemic Risk*].

23. *Id.*

24. *See* David E. Adelman & Kirsten H. Engel, *Adaptive Federalism: The Case Against Reallocating Environmental Regulatory Authority*, 92 MINN. L. REV. 1796, 1822 (2008) ("Remarkably little attention has been paid to the importance of differences among the states."); Heather K. Gerken & Ari Holtzblatt, *The Political Safeguards of Horizontal Federalism*, 113 MICH. L. REV. 57, 59 (2014) ("[C]ourts and scholars have neglected federalism's horizontal dimensions."). If anything, state heterogeneity has been roundly dismissed by contemporary federalism scholars who argue that state-level identification is an obsolete concept for most Americans. *See* SCHAPIRO, *supra* note 15, at 7 (2009); Jessica Bulman-Pozen, *Partisan Federalism*, 127 HARV. L. REV. 1077, 1109-12 (2014) [hereinafter Bulman-Pozen, *Partisan Federalism*]; Heather K. Gerken, *Foreword: Federalism*

which a system's components contain different material traits. Interdependence refers to the extent to which choices made by one component materially affect the behavior of others within the system. Systems made up of components that are different from one another will experiment differently than systems whose parts approach problems in the same way.[25] Similarly, systems whose parts share a lot of information with one another will approach experimentation differently than systems whose parts work in relative isolation.[26] This does not mean that more heterogeneity and more interdependence leads to more and better innovation: only that these two variables help to determine whether experimental federalism lives up to its hype. In turn, federalism's capacity for innovation and experimentation is not an inevitable outcome of decentralization and policy devolution, but is instead contingent on social and political forces that bring states closer together or further apart.

The overall goal here is limited in scope: to examine experimental federalism through complexity's lens and to begin fully accounting for the ways that heterogeneity and interdependence affect the system's performance. Part I positions federalism as a "complex adaptive system" composed of fifty semi-autonomous decision-making bodies that operate with significant degrees of independence. As a complex system, federalism's experimental output is an emergent feature of the system that is dependent on the system's levels of heterogeneity and interdependence. These two critical variables, in turn, help position the system on a continuum between randomness and rigidity, helping the system arrive at a "sweet spot" that allows for both stability and adaptation.

Part II explores the concept of heterogeneity, and examines how heterogeneity affects the quality and quantity of federalism's experimental output. It catalogs the ways that variation in state policy approaches can help the system overcome certain obstacles to effective problem-solving—bounded rationality, free-riding, premature convergence, and

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All the Way Down, 124 HARV. L. REV. 4, 16-17 (2010) [hereinafter Gerken, *Foreword: Federalism*].

25. *See infra* Part II.

26. *See infra* Part III.

cartelization. At the same time, it shows that diversity can increase the information costs associated with experimentation, while also inhibiting the system's ability to internalize the benefits of certain kinds of beneficial policy experiments.

Part III examines the concept of interdependence, and the ways that informational links between states change the system's emergent experimental approach. In particular, it suggests that stronger informational ties between nodes in a network tend to push the system towards exploiting existing information and policies, while weaker ties tend to bias the system towards the exploration of new solutions and the accumulation of new information.

I. FEDERALISM AS A COMPLEX ADAPTIVE SYSTEM

Complexity science is the study of "structural interagent dependencies and the system-wide effects they produce."[27] This Part provides a brief overview of three concepts that are critical to understanding how "complex adaptive systems" like federalism work: emergence, heterogeneity, and interdependence. It then explores how complex systems optimize their performance so that they are able to survive and adapt to changes in their environment and the ways that complexity can improve our understanding of experimental federalism.

A. *Emergence*

State-level policy experimentation is complicated.[28] Any attempt to describe whether and how states choose to experiment must account for the decentralized behavior and decision-making of thousands of federal, state, and local elected officials, administrative offices, political parties, and

27. Ruhl, *Managing Systemic Risk*, *supra* note 22, at 566.

28. *See* JOHN H. MILLER & SCOTT E. PAGE, COMPLEX ADAPTIVE SYSTEMS: AN INTRODUCTION TO COMPUTATIONAL MODELS OF SOCIAL LIFE 9 (Simon A. Levin & Steven Strogatz eds., 2007) (describing the distinction between "complicated" and "complex").

interest groups.[29] Moreover, these actors interact with one another within and across state borders and work within a dynamic environment filled with unexpected political, social, legal, and economic changes that affect policy decisions and outcomes. It is therefore impossible to understand experimental federalism in a real way without situating it in the context of a larger political system comprised of countless intra- and inter-state interactions.[30]

When trying to understand "complicated worlds," the standard scientific approach involves breaking the environment down into its component parts and trying to understand each one. If you want to understand the atom, break it down into electrons and sub-particles—by understanding and aggregating the parts, you can understand the whole.[31]

Constitutional theory has its own version of the standard scientific approach. This method involves examining the behavior of individual constitutional actors and drawing conclusions about larger institutions based on insights about those individuals. For example, a theorist will attempt to understand how individual Supreme Court justices behave and will then draw conclusions about how the Court functions by aggregating their individual behavior.[32]

The problem with this standard approach, in both science and constitutional theory, is that many natural and social systems exhibit *emergent* behavior: these systems have characteristics that may not be present in any of their components, and the whole may look very different than the sum of its parts.[33] Instead, the system's behavior is altered by interactions between the components, and the larger whole

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29. *See* Wiseman, *supra* note 15, at 1679-81.

30. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 503-09.

31. Pursley, *supra* note 21, at 548-49.

32. *See* Adrian Vermeule, *Foreword: System Effects and the Constitution*, 123 HARV. L. REV. 4 (2009).

33. *See* ROBERT AXELROD & MICHAEL D. COHEN, HARNESSING COMPLEXITY: ORGANIZATIONAL IMPLICATIONS OF A SCIENTIFIC FRONTIER 15 (Basic Books 2000) (2000); J.B. Ruhl, *Law's Complexity: A Primer*, 24 GA. ST. U. L. REV. 885, 894 (2008) [hereinafter Ruhl, *Law's Complexity*].

contains characteristics, features, and a larger order that are more than simply an aggregation of the system's parts.[34] Like a mosaic, it is impossible to understand the full picture simply by looking at the average tile, or even at each individual tile.[35]

The desire to understand and account for emergent behavior led natural and social scientists to begin exploring how "complex systems" work. Complex systems are "dynamic environments that contain multiple actors who interact with one another."[36] A system becomes more "complex" when the interactions among the system's "agents" become more important to defining the system's behavior.[37]

Despite their decentralized nature and emergent features, many complex systems prove remarkably resilient in their ability to adapt to change while maintaining their core features.[38] Financial markets, ecosystems, ant colonies, and social networks are all examples of "complex *adaptive* systems" that achieve some level of stability and order without any centralized direction.

Legal systems, with their countless interactions among interrelated institutions, legal actors, and rules, are rife with emergent behavior.[39] Accordingly, scholars from a wide range of legal disciplines, including constitutional law,[40] have begun to look for emergent features in legal systems and to use complexity to better explain how those systems work and improve the performance of legal institutions.[41]

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34. *See* MELANIE MITCHELL, COMPLEXITY: A GUIDED TOUR 12-13 (2009).

35. *See* MILLER & PAGE, *supra* note 28, at 44-45.

36. Scott E. Page, *Uncertainty, Difficulty, and Complexity*, 20 J. THEORETICAL POL. 115, 117 (2008).

37. *See* Ruhl, *Law's Complexity*, *supra* note 33, at 891.

38. *See* MITCHELL, *supra* note 34, at 13.

39. *See* Ruhl, *Managing Systemic Risk*, *supra* note 22, at 568 ("Emergen[t behavior] permeates legal systems.").

40. *See* Vermeule, *supra* note 32, at 36-37.

41. *See* Ruhl, *Law's Complexity*, *supra* note 33, at 909-11.

B. *Heterogeneity and Interdependence*

Emergence in complex systems is driven by two interrelated variables: heterogeneity (the level of variation of certain key characteristics and behaviors among the system's components) and interdependence (the way the components interact with one another and alter each other's behavior).[42] Heterogeneity drives emergent behavior by creating similarities and differences in how a system's components respond to different stimuli, producing system-level effects.[43] For example, consider the well-documented phenomenon of "panel effects," where the impact of judicial ideology is dampened when a three-judge panel is composed of ideologically heterogeneous judges appointed by both Republicans and Democrats.[44] Yet, as Heather Gerken points out, a system composed entirely of internally heterogeneous panels will produce a similar set of decisions at the system level as the ideological differences between panels become less significant—heterogeneity among the components, in this case, produces more homogenous system-level outcomes.[45]

Interdependence creates emergence through the connections between the system's components; as each one acts, its choices affect the behavior of other components. For example, consider the effects of interdependence on group decision-making (known as group polarization). A group composed entirely of members with the same viewpoint will produce outcomes that are more ideologically extreme than the views held by any member of the group due to the interactions among group members.[46] In that case, interdependence produces a system-level outcome that

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42. *See* AXELROD & COHEN, *supra* note 33, at 32-116; PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 17, 25; Jacob S. Sherkow, *The Natural Complexity of Patent Eligibility*, 99 IOWA L. REV. 1137, 1156-57 (2014).

43. *See* MILLER & PAGE, *supra* note 28, at 238-39; PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 17-18.

44. *See* CASS R. SUNSTEIN, WHY SOCIETIES NEED DISSENT 166-68 (2003).

45. *See* Heather K. Gerken, *Second-Order Diversity*, 118 HARV. L. REV. 1099, 1192-93 (2005) [hereinafter Gerken, *Second-Order Diversity*].

46. *See* SUNSTEIN, *supra* note 44, at 111.

differs significantly from the outcome desired by the average group member.

C. *Optimal Performance for Complex Systems*

Complex systems can be risky and fragile enterprises.[47] Since they are often composed of independent, autonomous agents with no centralized mechanism to coordinate the behavior of the individual components, they can fall apart or degenerate into chaos.[48] Moreover, when a system's components are highly interdependent, a change in a single component can reverberate throughout the entire system, making the system's behavior highly unpredictable and volatile (often referred to as the "butterfly effect").[49] Finally, complexity can make the system's behavior more difficult to predict, and make it more challenging to determine cause and effect when trying to assess or manipulate the system's behavior.[50]

Yet, despite their highly decentralized structure, complex adaptive systems can exhibit considerable stability and order over time.[51] They can be robust in the face of change, maintaining their structure and continuing to function despite changes in their environment.[52] These systems achieve their robustness through redundancy and feedback: they have many interdependent components that replicate each others' functions when one component fails, and the components send signals to one another to respond to systemic threats.[53]

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47. *See* Niall Ferguson, *Complexity and Collapse: Empires on the Edge of Chaos*, 89 FOREIGN AFF. 18 (2010); Ruhl, *Managing Systemic Risk*, *supra* note 22, at 587-92.

48. *See* STUART KAUFFMAN, AT HOME IN THE UNIVERSE: THE SEARCH FOR THE LAWS OF SELF-ORGANIZATION AND COMPLEXITY 73-74, 90-91 (1995).

49. *See* Daniel A. Leventhal & Massimo Warglien, *Landscape Design: Designing for Local Action in Complex Worlds*, 10 ORG. SCI. 342, 343-45 (1999).

50. *See* Ruhl, *Law's Complexity*, *supra* note 33, at 901-04.

51. *See* AXELROD & COHEN, *supra* note 33, at 9-10; PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 26.

52. *See* Ruhl, *Managing Systemic Risk*, *supra* note 22, at 570-75.

53. *See* Bednar, *Subsidarity and Robustness*, *supra* note 21.

At the same time, they can also adapt when confronted by disruptive environmental forces.[54] This adaptive quality is a partial function of heterogeneity among the system's components, which allow the system to simultaneously explore multiple strategies for surviving environmental shifts.[55] Complex systems also adapt through interdependent feedback mechanisms, which allow the system's components to gather information about their interactions with other system components or the larger environment and make changes to improve performance.[56]

As some have described it, complex adaptive systems achieve optimal performance by operating on the "edge of chaos" in a "sweet spot" between rigidity and randomness.[57] Systems that are too robust and rigid run the risk of obsolescence because they are unable to adapt to change.[58] At the same time, systems whose components are too responsive to change risk chaos and disintegration.[59]

As drivers of emergent behavior, heterogeneity and interdependence are critical to helping complex adaptive systems achieve an optimal "compromise between

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54. *See* J.B. Ruhl, *General Design Principles for Resilience and Adaptive Capacity in Legal Systems—With Applications to Climate Change Adaptation*, 89 N.C. L. REV. 1373, 1374-76 (2011).

55. *See* AXELROD & COHEN, *supra* note 33, at 108; MILLER & PAGE, *supra* note 28, at 29; Gewirtzman, *supra* note 21, at 509-11; Gregory Todd Jones, *Sustainability, Complexity, and the Negotiation of Constraint*, 44 TULSA L. REV. 29, 38 (2008).

56. *See* Pursley, *supra* note 21, at 562-63.

57. *See, e.g.*, KAUFFMAN, *supra* note 48, at 86; PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 32; Ysanne Carlisle & Elizabeth McMillan, *Innovation in Organizations from a Complex Systems Perspective*, 8 EMERGENCE 2 (2006); Chris Langton, *Computation at the Edge of Chaos: Phase Transitions and Emergent Computation*, 42 PHYSICA D 12 (1990); J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407, 1418 (1996) [hereinafter Ruhl, *The Fitness of Law*]; *see also* Ralph Stacey, *Strategy as Order Emerging from Chaos*, 26 LONG RANGE PLANNING 10, 10-17 (1993).

58. *See* Ruhl, *The Fitness of Law*, *supra* note 57, at 1442.

59. *See* Gewirtzman, *supra* note 21, at 508.

malleability and stability."[60] When states within a federalist system differ from one another in meaningful ways, the system is more likely to discover a policy approach that allows it to adapt and survive a political, social, or economic shift.[61] Moreover, if the states are at least somewhat interdependent, those adaptive experiments can easily "diffuse" to other states without any expenditure of resources by the federal government.[62]

At the same time, high levels of heterogeneity and interdependence can move a system dangerously close to randomness and chaos. A highly heterogeneous federalist system may lack the redundancy and shared culture necessary to retain its structural integrity in the face of change: high levels of interdependence can make the system prone to volatility as a change in one component can have major effects on others. As a result, it is important to think of heterogeneity and interdependence not as uniformly positive features within a system, but as critical engines for experimental federalism's emergent behavior.

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60. *See* KAUFFMAN, *supra* note 48, at 73, 80-81, 85; *see also* David J. Gerber, *Method, Community, & Comparative Law: An Encounter with Complexity Science*, 16 ROGER WILLIAMS U. L. REV. 110, 113-14 (2011).

61. *See* Gewirtzman, *supra* note 21, at 510-11.

62. For studies examining the diffusion of state policy experiments to other states, see, e.g., Berry & Berry, *supra* note 6; Virginia Gray, *Innovation in the States: A Diffusion Study*, 67 AM. POL. SCI. REV. 1174 (1973); Charles R. Shipan & Craig Volden, *The Mechanisms of Policy Diffusion*, 52 AM. J. POL. SCI. 840 (2008) [hereinafter Shipan & Volden, *Mechanisms of Policy Diffusion*]; Craig Volden, *States as Policy Laboratories: Emulating Success in the Children's Health Insurance Program*, 50 AM. J. POL. SCI. 294, 294 (2006); Jack L. Walker, *The Diffusion of Innovations Among the American States*, 63 AM. POL. SCI. REV. 880 (1969). Discussions of policy diffusion have slowly begun to find their way into the law review literature. *See, e.g.*, Michael Burger, *Policy Diffusion and the (Re)Federalization of Fracking Regulation*, 2013 MICH ST. L. REV. 1483 (forthcoming 2014); Brian Galle & Joseph Leahy, *Laboratories of Democracy? Policy Innovation in Decentralized Governments*, 58 EMORY L.J. 1333 (2009); Wiseman, *supra* note 15; Katerina Linos, Note, *When Do Policy Innovations Spread? Lessons for Advocates of Lesson-Drawing*, 119 HARV. L. REV. 1467 (2006).

D. *Complex Systems and Experimental Federalism*

Federalism bears all the hallmarks of a complex adaptive system.[63] Decentralized and dispersed governmental authority adds complexity and emergent potential to constitutional systems[64] by introducing new types of heterogeneity and interdependence. As a common structural solution for nation-states with diverse populations, federalism injects heterogeneity into the system by breaking a nation-state into subsidiary decision-making units that are often very different from one another.[65] Then, as states interact with one another, federalism creates new forms of interdependence. States share information, cooperate, and compete with each other,[66] altering each other's behavior like opposing players in a chess match.

The rest of this Article is an effort to explore how heterogeneity and interdependence among states affects the system's experimental output and its ability to hit the experimental "sweet spot" that allows for a simultaneous commitment to both continuity and change.[67] Like dials on an Etch-a-Sketch, heterogeneity and interdependence drive emergence and help position experimental federalism on a continuum between rigidity and randomness, enabling the system to maintain its robustness without losing its ability to adapt.

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63. Bednar, *Nudging Federalism*, *supra* note 10; Bednar, *Political Science of Federalism*, *supra* note 21, at 280 ("the complexities of federalism, in going from design to potential, require systems-level analysis."); Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 235 ("Federalism adds complexity to a democratic governmental system."); Post & Johnson, *supra* note 21, at 1059.

64. *See* Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 235 ("Federalism adds complexity to a democratic governmental system.").

65. *See* Dawn Brancati, *Decentralization: Fueling the Fire or Dampening the Flames of Ethnic Conflict and Secessionism?*, 60 INT'L ORG. 651, 681 (2006) (study concluding that decentralization is a "useful mechanism in reducing both ethnic conflict and secessionism.").

66. *See* David Lazer & Viktor Mayer-Schönberger, *Governing Networks: Telecommunication Deregulation in Europe and the United States*, 27 BROOK. J. INT'L L. 819, 826-36 (2002).

67. *See* Carlisle & McMillan, *supra* note 57.

There is one important caveat in thinking about complexity and federalism. Unlike many complex systems that operate with no central control and are entirely self-organizing,[68] federalism allows for centralized direction in the form of preemption or other efforts by the federal government to create national uniformity or to manipulate state policies in one direction or another. Yet even when complex systems are not fully self-organizing, "hierarchy serves as a kind of scaffolding" for complex behavior and emergence.[69] Even in policy areas where states operate with clear federal mandates, state governments can and do maintain significant discretion, and their actions and interactions with each other and the federal government affect policy implementation and its effects.[70] Rather than simplifying matters, different forms of cooperative or uncooperative federalism often add to the system's complexity, making state-level heterogeneity and interdependence relevant even when the federal government steps in to guide state policy experimentation.[71]

II. HETEROGENEITY AND EXPERIMENTAL FEDERALISM

Within federalism scholarship, heterogeneity typically arises in discussions about either localism or pluralism. From a localist perspective, federalism allows state governments,

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68. *See* MITCHELL, *supra* note 34, at 13.

69. Yaneer Bar-Yam, *Complexity Rising: From Human Beings to Human Civilization, A Complexity Profile*, *in* ENCYCLOPEDIA OF LIFE SUPPORT SYSTEMS 22 (2002).

70. *See, e.g.*, Jessica Bulman-Pozen & Heather K. Gerken, *Uncooperative Federalism*, 118 YALE L.J. 1256, 1258 (2009); Evan H. Caminker, *State Sovereignty and Subordinacy: May Congress Commandeer State Officers to Implement Federal Law*, 95 COLUM. L. REV. 1001, 1079 (1995); Cunningham-Parmeter, *supra* note 18, at 1676-77; Heather K. Gerken, *The Federal(ism) Society*, 36 HARV. J.L. & PUB. POL'Y 941, 943 (2013); Erin Ryan, *Negotiating Federalism*, 52 B.C. L. REV. 1, 4 (2011); Robert. A. Schapiro, *From Dualist Federalism to Interactive Federalism*, 56 EMORY L.J. 1, 8-9 (2006); Robert A. Schapiro, *Towards a Theory of Interactive Federalism*, 91 IOWA L. REV. 243, 250 (2005); Phillip J. Weiser, *Towards a Constitutional Architecture for Cooperative Federalism*, 79 N.C. L. REV. 663, 665-66 (2001).

71. *See* Cristina M. Rodriguez, *Negotiating Conflict Through Federalism: Institutional and Popular Perspectives*, 123 YALE L.J. 2094, 2103-08 (2014).

equipped with knowledge of their unique and very different communities, to make better policy choices than a "one size fits all" approach imposed by a national government.[72] From a pluralist vantage point, federalism prevents a heterogeneous society from breaking apart by allowing groups that are unable to garner a national majority to nevertheless find space to express their policy preferences at the state level.[73]

This Part argues that heterogeneity matters for experimental federalism as well. With its focus on emergent behavior, complexity brings heterogeneity's influential role in defining a system's experimental performance into sharp focus, raising new questions that have drawn surprisingly limited attention from constitutional scholars:[74]

- How do differences among states help to define federalism's emergent output of policy experiments and innovations?
- How can institutional designers build the "right amount" of heterogeneity into a federalist structure so that the system can enhance its adaptive capacity without losing stability?
- Is it possible for law to "nudge" experimental federalism towards the ideal level of heterogeneity at any given time, and if so, how do different types of interventions play out?

What follows is an initial effort to engage these questions by outlining the ways, both positive and negative, that heterogeneity among state policy preferences affects federalism's experimental output and emergent features. In turn, a better understanding of these dynamics can guide institutional and legal choices to improve federalism's capacity for innovation and experimentation.

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72. *See* Wallace E. Oates, *An Essay on Fiscal Federalism*, 37 J. ECON. LITERATURE 1120 (1999).

73. *See* Heather K. Gerken, *Federalism as the New Nationalism: An Overview*, 123 YALE L.J. 1889, 1895 (2014).

74. *See* Adelman & Engel, *supra* note 24, at 1822.

A. *The Upside of Heterogeneity*

Intuitively, the idea that "differences matter" for decentralized systems to thrive has some appeal.[75] For example, in complex biological systems, evolution occurs through mutations and variation among the system's components, launching a process of natural selection.[76] Heterogeneity is often a precondition for progress and survival in the natural world.

Within federalist systems, heterogeneity performs a similar function—it spurs emergent behavior that can help the system compensate for experimental deficiencies in its individual components.[77] Indeed, many of federalism's experimental benefits are dependent upon states having different policy preferences and approaching problems in materially different ways.[78]

Specifically, heterogeneity, as a systemic feature, benefits federalism by improving the system's ability to overcome four critical constraints on effective policy

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75. *See* Walter F. Powell & Stine Grodal, *Networks of Innovators*, *in* THE OXFORD HANDBOOK OF INNOVATION 56, 59 (Jan Fagerberg & David C. Mowery eds., 2006).

76. *See* Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 7 (describing biological adaptation as a "multifaceted selection process that gives diverse new forms a chance to prove themselves in the environment."); Ruhl, *Law's Complexity*, *supra* note 33, at 892.

77. In this context, heterogeneity refers to what Heather Gerken calls "second-order" diversity among state policy preferences about a given policy. As she defines it, "[s]econd-order diversity involves variation among decisionmaking bodies, not within them." Gerken, *Second-Order Diversity*, *supra* note 45, at 1102. "Second-order" diversity does not mean that each state has a diverse internal population. Indeed, high levels of first-order diversity (diverse populations within states) can actually decrease second-order diversity; states that all have the same very diverse population can end up with "second-order" preferences that look very similar to one another.

78. Federalism's experimental output is by no means limited to state activity. Local governments are a powerful source of policy experimentation. *See* Gerken, *Foreword: Federalism*, *supra* note 24; R.A. Lenhardt, *Localities as Equality Innovators*, 7 STAN. J. C.R. & C.L. 265 (2011); Charles R. Shipan & Craig Volden, *Bottom-Up Federalism: The Diffusion of Antismoking Policies from U.S. Cities to States*, 50 AM. J. POL. SCI. 825 (2006).

experimentation: (1) bounded rationality; (2) free-riding; (3) premature convergence; and (4) cartelization.

1. *Bounded Rationality*. State governments usually make decisions under uncertain conditions.[79] And, like most decision-makers, they face uncertainty while operating under conditions of "bounded rationality."[80] States often decide whether to conduct a policy experiment with limited information, incorrect information, or without full knowledge of all the available policy options and their potential implications.[81]

These limitations—regardless of whether they are caused by resource constraints, lack of expertise, a volatile environment, or political preferences—can make it difficult for a state to effectively search for and find the optimal policy. Indeed, state governments often do not expend their limited supply of time and energy to search for all the available policy options and will sometimes fail to select the best policy even if they are aware of it.[82]

Heterogeneity helps experimental federalism overcome the constraints that bounded rationality imposes on state policymakers and reinforces the notion that "[o]ptimal systems can be composed of suboptimal parts."[83] While the reasons require some detailed explanation, the basic idea is simple: given limited information, a heterogeneous population of states will engage in more policy experimentation and is more likely to discover the optimal

79. *See* Matthew C. Stephenson, *Information Acquisition and Institutional Design*, 124 HARV. L. REV. 1422, 1427 (2011) ("Most government decisions must be made under conditions of substantial uncertainty, in which the optimal choice depends on information about consequences that can never be known with anything approaching certainty.").

80. *See* Kurt Weyland, *Theories of Policy Diffusion: Lessons from Latin American Pension Reform*, 57 WORLD POL. 262, 271 (2005).

81. *See* Wiseman, *supra* note 15, at 1671-72.

82. *See* Steven Callandar, *Searching for Good Policies*, 105 AM. POL. SCI. REV. 643, 643 (2011).

83. Bednar, *Political Science of Federalism*, *supra* note 21, at 280.

policy options than a homogeneous group of states.[84]

In order to understand the relationship between heterogeneity and bounded rationality, imagine two different countries that use a federalism model, and that each country is composed of nine states. In the first country, known as Homogeneous Nation, all the states are similar to one another: their populations have similar political preferences, they measure policy success in similar ways, and they use similar methods to address policy problems, like a country composed of fifty states of Texas. In the second country, known as Heterogeneous Nation, the states differ from one another in meaningful ways. Each state has different core political values, different policy objectives, and different measurements for success.[85] Most importantly, the states in both nations have one thing in common: they are all equal in their problem-solving ability.[86]

Suppose the states in each nation were asked to solve the same policy problem: the best policy for cutting emissions from power plants within their state. Each state has the same menu of ten policies (designated A–F) to choose from. Each of those policies is ranked on a scale of 1–10 (10 being the best option) according to three metrics: economic cost, effectiveness in reducing emissions, and the degree to which the policy reflects the preferences of the state's electorate (political cost).

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84. *See* SCOTT E. PAGE, THE DIFFERENCE: HOW THE POWER OF DIVERSITY CREATES BETTER GROUPS, FIRMS, SCHOOLS, AND SOCIETIES 157 (2007) [hereinafter PAGE, THE DIFFERENCE].

85. *See* Charles R. Shipan & Craig Volden, *Policy Diffusion: Seven Lessons for Scholars and Practitioners*, 72 PUB. ADMIN. REV. 788 (2012) [hereinafter Shipan & Volden, *Policy Diffusion*] (suggesting state policy goals vary from state to state).

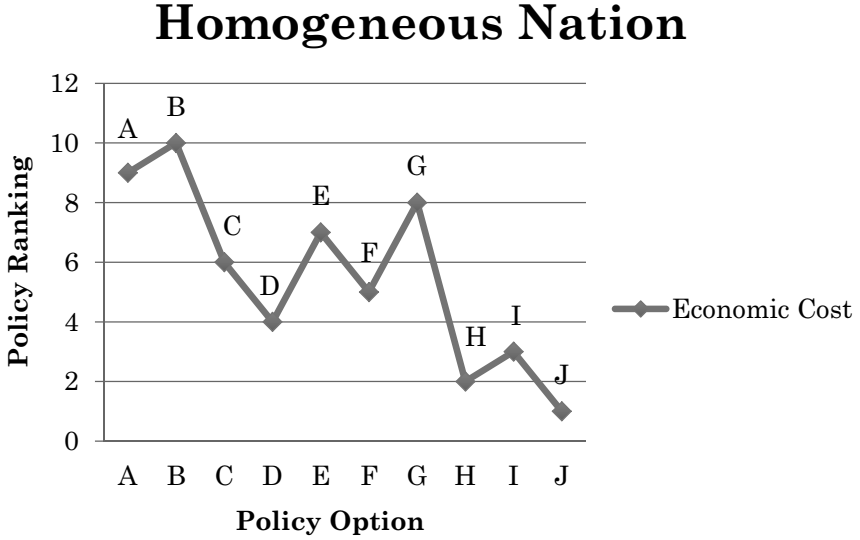
86. *See* PAGE, THE DIFFERENCE, *supra* note 84, at 153.

Policy	Economic Cost	Effectiveness	Political Cost	Total
A	9	7	7	23
B	10	5	9	24
C	6	10	8	23
D	4	3	3	10
E	7	6	1	14
F	5	9	4	18
G	8	1	6	15
H	2	2	5	9
I	3	4	2	9
J	1	8	10	19

When all three factors are considered together and weighted equally, Options A, B, and C are the optimal policy choices.[87]

In Homogeneous Nation, the states have similar priorities and perspectives. As a result, each state is focused on one factor above all others: economic cost. If we graph the ten policy options based on cost, here's how they look:

87. *See id*. at 139-43.



How will the states in Homogeneous Nation, operating under conditions of bounded rationality without knowledge of which policy is best, go about searching for the best policy within this "policy landscape?" Let's assume that each individual state will begin their search by examining one potential solution. This "starting point" might be the result of many factors: political realities, policy preferences, cost limitations, or path dependence (the notion that past policy choices exert a large effect on future decisions). Further, let us assume that each state in Homogeneous Nation, again operating under conditions of bounded rationality, will expend some (but not unlimited) time trying to solve the problem. Moreover, each state is willing to expend resources to explore some, but not all, alternative policy options (beyond their starting point) to see if there is a better choice available.

To represent bounded rationality's limitations on each state's experimental strategy, states in Homogeneous Nation use the following process to find the best possible policy: they will start at a random point on the landscape, and will then

look to solutions to the immediate left or right. If those solutions are better than the starting point, they will adopt that solution and repeat the search process from the new vantage point. When they arrive at a solution where there is no better solution to the immediate left or right, they will stop and implement that option.[88]

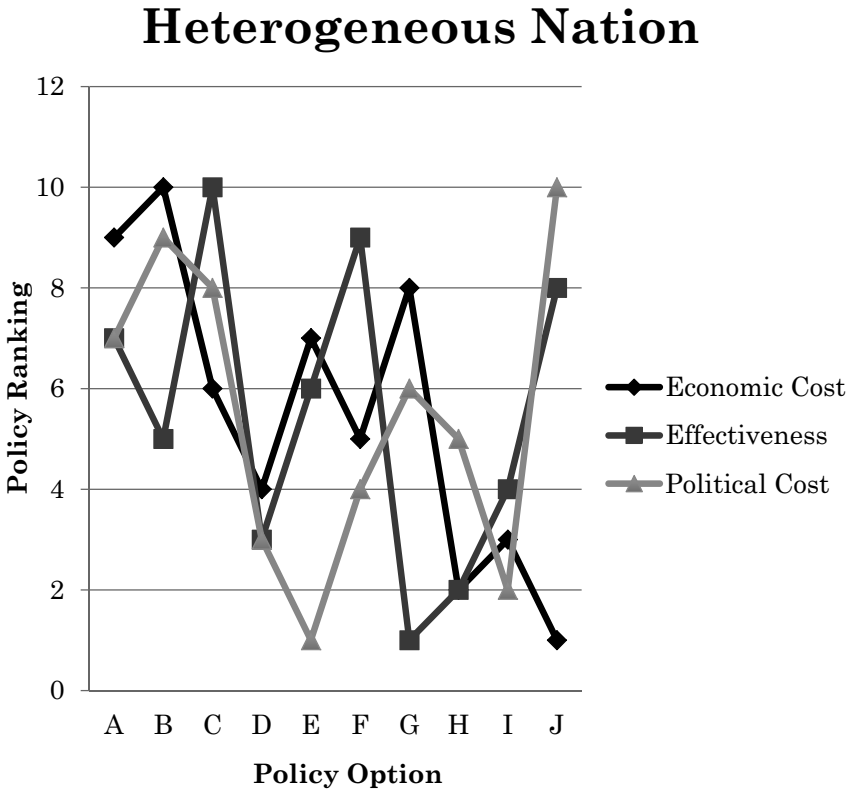
For each state, this stopping point is known as the "local optimum."[89] For example, a Homogeneous Nation state starting at Option D will look to Options C and E on the immediate left and right and choose E, which has a higher value than either C or D. Then, repeating the search from Option E, it examines Options D and F. Seeing that E is higher than both, the state selects Option E—its local optimum. Similarly, a state that starts at Option I will remain "stuck" there, since options H and J to the immediate left and right both have lower values.

Assuming a random distribution of starting points, the nine states within Homogeneous Nation will get stuck at one of four local optima: Options B, E, G, or I. Homogeneous Nation will produce four policy experiments and gather data about those four policy options. Only one of those options—Option B—is among the top four overall options, known as "global optima."

Now, consider states within Heterogeneous Nation operating with the same search strategy. In Heterogeneous Nation, the states disagree about how to assess which policy is best: there are three states that care most about economic cost, three that care about effectiveness, and three that care about political cost. Their policy landscape, which contains a much wider range of local optima, looks like this:

88. *See id*. at 141.

89. *Id.*



The states that care about cost will get "stuck" on one of four solutions: B, E, G, and I—the same solutions adopted by Homogeneous Nation. But the states that focus on effectiveness will arrive at different local optima—Options A, C, F, and J. And states that focus on political costs will end up at solutions B, G, and J. Within Heterogeneous Nation, states will potentially conduct nine different experiments from a population of eight potential solutions: A, B, C, E, F, G, I, and J. When compared with Homogeneous Nation, there will be more policy experimentation, more information gathered about the policy landscape, and a greater chance that at least one state will arrive at one of the best overall solutions—A, B, or C.

Why is Heterogeneous Nation better able than Homogeneous Nation to overcome bounded rationality's limitations? Similar states are likely to attack policy problems in similar ways.[90] They are likely to start their search at similar places, evaluate policy options using similar metrics, and use similar search strategies.[91] This means the states in Homogeneous Nation are more likely to have the same local optima and that they will get "stuck" on similar solutions.

By contrast, heterogeneity increases the possibility that states will begin searching for solutions in different places, use different metrics, think about their search in different ways, and get stuck at different local optima.[92] This increases both the range of local optima within the system and the chances at least one state will experiment with solutions that are among the best available solutions.[93] It also means a wider range of different policies will actually make it to the experimentation stage.

Heterogeneous Nation's superior ability to deal with the limits of bounded rationality is dependent on a few pre-conditions: the problem solvers in Homogeneous Nation cannot be significantly better at problem-solving than the states in Heterogeneous Nation, and the states in Heterogeneous Nation need to have some differences in their "local optima."[94] But assuming these basic conditions are in place, Heterogeneous Nation will not only produce more experiments, but is more likely to arrive at the global optimum.[95]

2. *Free-Riding*. Federalism scholars have long recognized the significant risk that states will free-ride off each others' experiments.[96] In short, the argument goes, since a state will

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90. *See id.* at 153, 157.

91. *Id.* at 153-58.

92. *Id.*

93. *Id.* at 157.

94. *Id.*

95. *See id.* at 152-65.

96. *See* Rose-Ackerman, *supra* note 13, at 610-11.

produce information about its own policy experiments that is available at little or no cost to other states, states have an incentive to "free-ride" on each other's experiments.[97] This creates a problem: rather than conducting experiments or gathering information about a policy issue, many states will choose to simply do nothing.[98] Instead, they will let other states undertake risky experiments and wait to get information about the results.[99] They will then "copy" successful experiments without having to undertake the cost and risk of experimenting on their own, and reject the unsuccessful ones.[100] The result is a sub-optimal level of experimentation, where free riders wait for first-movers to take on the risk of failure rather than trying out their own innovations.[101]

Free-riding creates at least two major problems for experimental federalism. First, it leads to less experimentation because free-riding states will choose to let other states take on the political and economic risks of policy failure rather than conducting their own policy experiments. Indeed, when there is a high risk that other states will free-ride off their experiments, innovating states may intentionally choose policies that are less attractive to other states—and even inadequate for their own needs—to prevent others from copying their experiments.[102]

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97. Indeed, because technology has made it easier than ever before to obtain information, it also becomes easier to free-ride off the information generated by other states. David Lazer, *Information and Innovation in a Networked World*, *in* DYNAMIC SOCIAL NETWORK MODELING AND ANALYSIS: WORKSHOP SUMMARY AND PAPERS 101 (Ronald Breiger et al. eds., 2003) [hereinafter Lazer, *Information and Innovation*].

98. *See* Stephenson, *supra* note 79, at 1464-67.

99. *See* Rose-Ackerman, *supra* note 13, at 603-06; Stephenson, *supra* note 79, at 1464-67.

100. *See* Rose-Ackerman, *supra* note 13, at 604. There is some data to suggest that this is a real problem, and that states will under-experiment when there is a high risk of free riding. *See* Galle & Leahy, *supra* note 62, at 1343.

101. *See* Rose-Ackerman, *supra* note 13, at 605-06.

102. *See* Steven Callandar & Bård Harstad, *Experimentation in Federal Systems* 3 (Nat'l Bureau of Econ. Research, Working Paper No. 19601, 2013), *available at* http://www.nber.org/papers/w19601.

Second, free-riding risk causes information deficits, as experimenting states choose not to generate or share information about their policies to prevent other states from free-riding.[103] This deprives the system of critical data that could help other states or the federal government identify the best available policy solution.[104]

Heterogeneity offers a systemic solution to both under-experimentation and information deficits.[105] In Homogeneous Nation, where jurisdictions have similar policy preferences, the risk of free-riding is high: policies are easily transferable from one state to another and the information generated about an innovating state's experiments will be very useful to other states.[106] Therefore, with a lot of useful information available at low cost, states will have a strong incentive to free-ride on other states' experiments instead of innovating.[107]

Heterogeneous Nation, by contrast, should have fewer free-riders because policy solutions that work in one state are less likely to work in others.[108] Since information about other states' experiments is less useful,[109] states in Heterogeneous Nation are less likely to copy one another's innovations and more likely to conduct experiments on their own. As one recent study notes, "[i]n the case of highly dissimilar jurisdictions, there is innovation because, contrary to the assumptions of the free-rider scenario, there is little or no information externality. Information generated in one place is just not that useful in others."[110] Moreover, states in

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103. Galle & Leahy, *supra* note 62, at 1351-52.

104. *Id.*

105. *Id.* at 1346-47.

106. *Id.*

107. *See* David Lazer, *Regulatory Capitalism as Networked Order: The International System as an Informal Network*, ANNALS AM. ACAD. POL. & SOC. SCI., Mar. 2005, at 52, 61 [hereinafter Lazer, *Regulatory Capitalism*].

108. *See* Callandar & Harstad, *supra* note 102, at 3; Lazer, *Information and Innovation*, *supra* note 97, at 110.

109. *See* Cai & Treisman, *supra* note 11, at 49; Callandar & Harstad, *supra* note 102, at 3.

110. *See* Galle & Leahy, *supra* note 62, at 1360.

Heterogeneous Nation will produce more information about their experiments since that information is less likely to be useful to competitors.

Even when there is a high risk of free-riding, some states will still decide to experiment and produce information.[111] In particular, policy evangelists—states that want their policies to spread to other states—will generate information about their experiments in the hope the other states will adopt the policy.[112] Some evangelists want to advance a national political profile or agenda; others want to pocket the network effects that come with more states adopting their chosen policy.[113]

Heterogeneous Nation creates a fertile ground for policy evangelism, and evangelists help the system overcome the information deficits created by free-riding risks. Evangelists are more likely to invest resources in generating information about their experimental results if they think there is a good chance that other states will use it to adopt their preferred policy, and less likely to invest if there is little chance of the policy spreading.[114] In Homogeneous Nation, where states largely agree on policy objectives, there may be little incentive for policy evangelists to invest in generating information about their policies because there are few areas of disagreement to begin with—policy evangelists are always preaching to the choir, and there are only very few states that need convincing. Moreover, polarization—a phenomenon that occurs within homogeneous groups—moves group members towards more extreme positions, making them even less susceptible to different perspectives.

By contrast, if Heterogeneous Nation contains a wide distribution of policy preferences, policy evangelists have a greater chance of finding another state that might be interested in copying their policy. This should incentivize

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111. *Id.* at 1361-67.

112. *Id.* at 1386. There are a lot of reasons states might want to get other states to adopt their solutions—politicians that hope to create a national reputation, or the network benefits that can result from other states adopting the same model. *See* Gerken & Holtzblatt, *supra* note 24, at 63.

113. Galle & Leahy, *supra* note 62, at 1386-89.

114. *See* Stephenson, *supra* note 79, at 1471-74.

evangelist states to invest in producing information about their policies, even when there is some risk that others will free-ride off of their efforts.

3. *Premature Convergence.* Sometimes, states all arrive at a similar solution to a policy problem, but that solution turns out to be suboptimal or may prove suboptimal as time goes on. This problem is known as premature convergence, and it prevents federalist systems from internalizing the full benefits of state experimentation. The laboratories simply shut down before they have a chance to explore the entire policy landscape and the system loses out on valuable information and exploration.

Premature convergence is the product of three phenomena: information cascades, risk-aversion, and polarization. Heterogeneity helps federalism minimize the risk associated with all three sources of premature convergence, and prevents states from getting "stuck" with the same suboptimal policy.

Cascades. Premature convergence can arise from information cascades, where policymakers stop relying on their own information and begin to make decisions based on the actions of others.[115] This type of "policy contagion" can occur, for example, when a series of Democratic state legislatures rapidly enact a policy that has been adopted by a leading "blue" state without questioning the rationale behind the policy, the accuracy of its policy results, its potential long-term effects, or its suitability for other states.[116] If the initial state's information or decision is flawed or somehow incomplete, information cascades can cause decentralized systems to converge prematurely on a bad policy. Moreover, information cascades can shut down the search for new information or lead decision-makers to

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115. SUNSTEIN, *supra* note 44, at 55; *see* Sushil Bikhchandani et al., *Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades*, 12 J. ECON. PERSP. 151, 154 (1998).

116. For examples of this sort of convergence, see GRAEME BOUSHEY, POLICY DIFFUSION DYNAMICS IN AMERICA (2010) [hereinafter BOUSHEY, POLICY DIFFUSION]; Sean Nicholson-Crotty, *The Politics of Diffusion: Public Policy in the American States*, 71 J. POL. 192 (2009).

improperly discount information that is actually useful.[117]

Cascade risks are even higher in a networked world where, at very low cost, states can easily learn and free-ride off what other states are doing[118] and where interest groups or political parties can launch simultaneous policy initiatives in multiple states.[119] Experimental federalism also carries a high risk of cascades that flow from bad information. In order to avoid the high political costs that come from policy failures, state leaders have strong political incentives to hide negative information about the policy or to produce information that is unreliable or incomplete.[120]

Heterogeneity is a partial systemic solution to cascade risks. As discussed earlier, Heterogeneous Nation will produce more experiments and a greater amount of publicly available information than Homogeneous Nation. It is also more likely that Heterogeneous states will generate different types of information, prioritize that information differently, and analyze existing information in different ways. The quantity and diversity of information in Heterogeneous Nation makes it less likely that a single piece of information will permeate throughout the entire system[121] and more likely that at least some actors within the system will discount cascading information. Different value systems create incentives for states to evaluate policy success in different ways, which constrains the risk of cascades.

Heterogeneous Nation will also contain a wider distribution of states whose preferences leave them with different abilities to tolerate risk—some states are risk-seeking early "adopters" of innovative policy; others are risk-averse late "adopters."[122] The late adopters are more likely to view information with a skeptical eye towards the risks

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117. *See* Stephenson, *supra* note 79, at 1475-76.

118. *See* Adrian Vermeule, *Second Opinions and Institutional Design*, 97 VA. L. REV. 1435, 1455-56 (2011).

119. *See* Lazer, *Regulatory Capitalism*, *supra* note 5107, at 62.

120. *See* MALCOLM M. FEELEY & EDWARD RUBIN, FEDERALISM: POLITICAL IDENTITY AND TRAGIC COMPROMISE (2008); Rubin & Feeley, *supra* note 12.

121. Lazer, *Information and Innovation*, *supra* note 97, at 117.

122. *See* Shipan & Volden, *The Mechanisms of Policy Diffusion*, *supra* note 62.

involved in change. This delay not only helps to stop cascades, but gives the federal government more time to learn about the long-term consequences of a given policy before deciding to pursue national implementation.[123]

Risk-Aversion. A second cause of policy convergence is risk-aversion. Federalist systems can generate suboptimal experimentation because no state will deliberately choose to experiment with a policy that is likely to fail.[124] When effective experimentation relies on something like the scientific method to succeed—the ability to test multiple hypotheses and to systematically observe which hypotheses are proven or disproven—the system benefits from failed experiments, which generate information that is useful for subsequent experiments. Since no state wants to take on the costs of failure and there is no centralized body that assigns riskier policy options to reluctant states, each state will try and choose the best available option and avoid experiments with low odds but potentially high payoffs.[125] Instead of having multiple states engaged in simultaneous experiments, all states will converge around the same low-risk experiment.[126] While this experiment may be the best immediately available option, it might not be the optimal long-term option or even the one with the highest potential payoff.

But in Heterogeneous Nation, a solution that works in one state may not work in another. States are more likely to disagree about what the best option is and how to measure success and will find a larger range of policy options potentially attractive. This increases the chance that instead of converging on a single best-available option, states will disagree about what the best-available option actually is. This disagreement makes it more likely that states will experiment with different policies, including innovations that might fail in the long run but will nevertheless produce useful information.

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123. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 510-11.

124. *See* FEELEY & RUBIN, *supra* note 120, at 27.

125. *See id.* at 26-28.

126. Cai & Treisman, *supra* note 11, at 49.

Polarization. A third source of premature convergence is group polarization: the well-documented tendency of like-minded groups to adopt more extreme views than each member of the group would adopt on their own.[127] A nation composed of a large number of "red states" is more likely to adopt policies that are extremely conservative than a nation where "red states" enjoy a small majority. In a federalism context, polarization can decrease and homogenize the range of experiments each state is willing to conduct and lead states to discount potentially useful information that conflicts with the polarized perspective.

Just like judicial panels composed of a diverse group of judges, state heterogeneity can help a decentralized system resist pressure towards premature convergence on a small range of extreme solutions generated by a polarized political environment. "Dissenting" states can slow policy diffusion and potentially operate as a moderating force by "fact-checking" the information provided by polarized states and help the system generate a full range of policy alternatives.

4. *Competition and Cartels.* As Michael Greve points out, the success of experimental federalism hinges in part on whether states are operating in a cooperative or competitive context.[128] Competition promotes innovation,[129] as states seek to develop policies that will differentiate them from their neighbors and draw taxpayers and jobs.

Yet states (like most industries), if left to their own devices, may choose not to compete with one another.[130] Instead, they will try to cooperate and form cartels. When operating in this cooperative mode, Greve suggests they will

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127. SUNSTEIN, *supra* note 44, at 111. For evidence of polarization in state governments, see Justin Phillips & Jeffrey Lax, *The Democratic Deficit in the States*, 56 AM. J. POL. SCI. 148 (2012); Pickerill & Bowling, *supra* note 16, at 372-73.

128. GREVE, *supra* note 1, at 195; *see also* JOSEPH F. ZIMMERMAN, HORIZONTAL FEDERALISM: INTERSTATE RELATIONS (2011); Winter, *supra* note 10, at 276 (arguing that federalism capitalizes on the experimental benefits of competition).

129. *See* ZIMMERMAN, *supra* note 128; Ann O'M. Bowman, *Horizontal Federalism: Exploring Interstate Interactions*, 14 J. PUB. ADMIN. RES. & THEORY 535, 536 (2004).

130. Shipan & Volden, *Policy Diffusion*, *supra* note 85, at 790.

work together to seek federal intervention or preemption in order to avoid the costs of having to compete with other states on taxes or policy.[131] This state-level push towards cartelization can have negative effects on innovation and experimentation. In a cooperative environment, states may seek uniform federal regulation and encourage the national government to assume costs or responsibility for programs and value choices that would otherwise impose economic and political costs on state political actors. And, with little incentive for cartelized states to innovate in order to compete for a limited pool of resources, state policies will remain at the status quo.

Heterogeneity can help preserve a competitive policy environment[132] and guard against joint efforts by states to seek preemptive uniform policy from the federal government. With "dissenting states" acting as a potential barrier to collective action, heterogeneity makes it more difficult for states to engage in the sort of cooperative, cartelizing behavior that shuts down innovation.[133] When there is a strong minority of states that disagree with the majority's efforts towards cartelization, those states can resist federal preemption and preserve policy competition and state-level innovation.

B. *The Downside of Heterogeneity*

Heterogeneity comes with a cost, and within a federalist structure those costs can be substantial. While federalism can serve as a mechanism for managing diversity within a society,[134] heterogeneity can be a source of social conflict among states or between states and the national government. In its most extreme incarnation, heterogeneity can cause the types of irreconcilable differences that result in civil war and disintegration.[135]

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131. GREVE, *supra* note 1, at 191-92.

132. PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 216-17.

133. GREVE, *supra* note 1, at 10.

134. BEDNAR, ROBUST FEDERATION, *supra* note 10, at 45, 47; Brancati, *supra* note 65, at 681 (concluding that decentralization is a "useful mechanism in reducing both ethnic conflict and secessionism.").

135. BEDNAR, ROBUST FEDERATION, *supra* note 10, at 47.

But even in a more benign form, too much heterogeneity can act as an obstacle to federalism's ability to facilitate innovation and can place limits on the system's ability to internalize the benefits gained from certain kinds of experiments. Specifically, federalist systems with high levels of heterogeneity can experience problems caused by: (1) increased information costs; (2) barriers to collective action; and (3) limitations on the network benefits associated with certain policies.

1. *Information Costs.* Heterogeneity can make it more difficult for decentralized systems to aggregate information.[136] States will gather and analyze information in ways that reflect their policy goals. When states have different goals and values, the information they generate will differ as well. These variations in the types of information that states produce can make it difficult to compare the effectiveness of policies from different states, or to aggregate information about policies implemented in multiple states. Moreover, just as similarities make it more likely that entities will communicate with one another,[137] preferential differences can also make it more likely that a state will discount or ignore useful information from other states based on mistrust of its sources.[138]

Even in situations where states trust the information produced by other states, heterogeneity may render the information less useful. On the state level, federalist systems benefit when innovations generated by one state prove useful to others.[139] But when states have different goals, the innovations they generate are not as easily transferable.[140] Heterogeneity can constrain the system's potential for

136. *See* FEELEY & RUBIN, *supra* note 120, at 27-28.

137. *See* Miller McPherson et al., *Birds of a Feather: Homophily in Social Networks*, 27 ANN. REV. SOC. 415 (2001).

138. *See* Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 245-46.

139. *See* Cunningham-Parmeter, *supra* note 18.

140. BEDNAR, ROBUST FEDERATION, *supra* note 10, at 31; Craig Volden, *Entrusting the States with Welfare Reform*, *in* THE NEW FEDERALISM: CAN THE STATES BE TRUSTED? 82, 83 (John A. Ferejohn & Barry R. Winegast eds., 1997).

replication: there may be more innovation occurring, but "the overall societal gains from innovation will be small."[141]

Heterogeneity presents similar obstacles for the vertical diffusion of state experiments. From the federal government's perspective, the most useful state laboratories are those that best reflect the national population's preferences, since those states generate innovations that are most likely to work, and have political support, on the national level. Greater heterogeneity limits the number of states that fit this profile, which constrains the federal government's access to useful information and places a cap on the range of state policy experiments suitable for national adoption.[142]

2. *Coordination and Collective Action.* Heterogeneity among states can become problematic when effective innovation requires some form of coordinated or collective action.[143] This can lead to: (a) difficulty solving highly complex policy problems; (b) decreased levels of public goods; (c) an increase in negative externalities created by state experimentation; or (d) inefficiency and stagnation when policymaking relies on cooperation between states and the federal government.

Greater Difficulty in Solving Complex Policy Problems. Consider three types of policy problems that are confronted by Heterogeneous and Homogeneous Nations: simple, moderate, and difficult. For simple problems, where the policy landscape clearly leads each problem solver toward the global optimum, picture a landscape that looks like a single mountain peak: heterogeneity can create a lot of inefficiency and wasted time.[144] With simple problems, where a fairly unsophisticated problem solver can locate the global

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141. *See* Galle & Leahy, *supra* note 62, at 1360.

142. Ken Kollman et al., *Decentralization and the Search for Policy Solutions*, 16 J. L. ECON. & ORG. 102, 121-24 (2000) [hereinafter Kollman et al., *Decentralization*]; *see also* Lazer & Mayer-Schönberger, *supra* note 66, at 838.

143. *See* Kollman et al., *Decentralization*, *supra* note 142, at 124.

144. *Id.* at 104, 117-18.

optimum, a homogeneous environment may provide a more efficient structure for arriving at the optimal solution.[145]

But moderately complex problems look more like the multi-peaked, "rugged" landscape confronted by Heterogeneous and Homogeneous Nations earlier.[146] Harder problems often have many local optima where problem solvers get stuck, and those local optima change dramatically depending upon the individual problem solver's interpretive perspective.[147] As a result, heterogeneity can make a real difference when states encounter a moderately complex problem and where diverse perspectives alter each problem-solver's approach to policy search.[148]

For problems of high complexity (e.g., an effort to cure cancer), where there are many local optima and where the search for a global optimum is exceedingly challenging, heterogeneity can potentially inhibit the system's performance.[149] These types of problems may benefit from centralized goal-setting and coordination, a well-established centralized research structure and larger budgets, collaboration, as well as avoiding the potential externalities that can result when multiple decentralized entities are adopting different policies.[150] These externalities can increase the complexity of the problem and even alter the outcomes associated with different solutions.[151]

As a result, policy differences within Heterogeneous Nation may make it more difficult for states to cooperate or respond well to coordination by the federal government. In turn, Homogeneous Nation may be in a better position to deal with highly complex or resource-intensive problems where

145. *See id.*

146. *See id.* at 117.

147. *Id.* at 114.

148. *See id.* at 119-20.

149. *Id.*

150. *Id.* at 124.

151. *See* BEDNAR, ROBUST FEDERATION, *supra* note 10, at 32-33; Kollman et al., *Decentralization*, *supra* note 142, at 121. Note that these conclusions don't account for a volatile system environment. Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 9 n.3.

cooperation among the system's components is essential to finding a solution.

Decreased Public Goods. Collective action remains a challenge in any federalist system, and heterogeneity can exacerbate the problem when states must act together to provide certain public goods.[152] If states are only willing to support policy experiments that further their own individual policy goals, differences in goals can mean fewer contributions towards those shared efforts.[153] This lack of social consensus may also make it less likely that states will agree to try out selfless experiments: innovations that impose significant costs on the experimenting state, but would benefit the nation as a whole.[154]

Increased Negative Externalities. Heterogeneity can also increase the potential for states to adopt policies that harm other states by creating obstacles to cooperative actions that minimize them.[155] While federal action is often the best available solution for state policies that impose negative externalities, it is also hard to bring about.[156] More often than not, states must rely on more informal methods of negotiation and cooperation to deal with spillover effects.[157] To the extent that differences among states make this sort of negotiation and cooperation difficult and more contentious, heterogeneity can lead to an increase in state experiments that benefit the innovating state but externalize negative costs onto others.

Uncooperative Federalism. Policy experimentation in certain areas is generated through the "cooperative" efforts of state and federal authorities, in which states generate policy experiments within the constraints of broad federal

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152. *See* Rui J.P. de Figueiredo, Jr. & Barry R. Weingast, *Self-Enforcing Federalism*, 21 J. L. ECON. ORG. 103 (2005).

153. *See* PAGE, THE DIFFERENCE, *supra* note 84, at 281-82; Aziz Z. Huq, *Does the Logic of Collective Action Explain Federalism Doctrine?*, 66 STAN. L. REV. 217, 246 (2014).

154. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 510-11.

155. Gerken & Holtzblatt, *supra* note 24, at 61-62.

156. *Id.* at 90.

157. *See id.* at 90-91.

guidelines or with the active cooperation of federal officials. When state and federal governments have similar goals, cooperative federalism can lead to effective innovation.[158] However, when federal and state authorities have different goals, the relationship can become adversarial and "uncooperative," which can make it difficult to search for the best policy or develop a coherent strategy.[159] To the extent that heterogeneity makes it more likely for a high number of states to maintain policy goals that depart from national preferences, it can act as an obstacle to optimal policy experimentation in the "cooperative" federalism sphere.

3. *Network Benefits.* Certain policies benefit from widespread adoption: the more states that implement the policy, the greater the benefits. These network benefits can increase with the number of states that adopt the policy. For example, state policies that affect multi-state businesses may only be worthwhile if a critical mass of states adopt the same policy.[160]

If an experiment benefits from network effects, heterogeneity imposes a cost by making it less likely that a policy will transfer between jurisdictions. To the extent that heterogeneity makes it more difficult to achieve convergence around a single policy, policies that enjoy significant network effects will suffer and policy experiments that are only optimal when significant numbers of states adopt them will go unexplored.[161]

C. *Managing Heterogeneity*

Heterogeneity is a critical variable in determining whether federalism delivers on its experimental promise. A system that is able to maintain diverse policy approaches may have an advantage in dealing with the experimental limits presented by bounded rationality, free-riding, premature convergence, and cartelization. At the same time, a heterogeneous system may be more likely to struggle with

158. *See* Bednar, *Political Science of Federalism*, *supra* note 21, at 277.

159. *See id.*

160. *See* Yair Listokin, *Learning Through Policy Variation*, 118 YALE L.J. 480, 545 (2008).

161. *Id.*

increased information costs, barriers to experiments that depend on collective or cooperative action, and under-experimentation with policies whose full potential depends on network benefits.

Beyond its effects on experimental output, heterogeneity also helps maintain a "robust federation" that can survive catastrophic events and adapt to change.[162] As Jenna Bednar has noted, federalism's decentralized structure has the added normative benefit of strengthening the system's resilience to change by creating redundancies in governmental responsibility, while also helping the system adapt to change through policy diversity.[163] Just like complex ecosystems, diversity can help enhance federalism's robustness and the system's long-term potential for survival in a dynamic world.[164]

A full account of heterogeneity's effects on experimental federalism is only a launching pad for further exploration. As a relatively new discipline, there is still much to learn about how dynamic social systems can "harness complexity," whether it's possible to identify the "right amount" of heterogeneity at any given time, the best mechanisms for moving a complex system's components towards diversity or homogeneity, or the extent to which legal efforts to change a complex system will alter system-level behavior in a predictable way.[165] These are cutting edge and unresolved issues for complexity science and well beyond the introductory scope of this Article, but a focus on heterogeneity suggests a frame for further investigation of the relationship between law, experimental federalism, and heterogeneity.

Policy diversity is not an inevitable outgrowth of federalism's decentralized design,[166] even when the federal government decides to stay outside the fray and allows space

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162. *See* BEDNAR, ROBUST FEDERATION, *supra* note 10.

163. *See id.* at 170-212.

164. *See* PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 180-81.

165. *Id.* at 254-55.

166. *Cf.* Mark Tushnet, *What Then Is the American?*, 38 ARIZ L. REV. 873, 876 (1996).

for state policy experimentation.[167] Political forces that cross state borders, like national political parties and interstate interest groups, pursue national policy agendas through state legislation and exert a potentially homogenizing effect on the experimental choices available to state policy makers.[168] Interstate economic and social forces blur state boundaries,[169] as "individuals from Montana to Mississippi to Maine can eat at the same restaurant chains, shop at the same stores, read the same publications, and listen to the same music."[170] Interstate mobility[171] and "The Big Sort"[172]

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167. Federal action and preemption can often result in policy uniformity. *See* Adelman & Engel, *supra* note 24, at 1825; Cherry, *supra* note 21, at 401; Listokin, *supra* note 160, at 551-53.

168. *See* Jessica Bulman-Pozen, *From Sovereignty and Process to Administration and Politics: The Afterlife of American Federalism*, 123 YALE L.J. 1920, 1955 (2014) ("National networks pushing national agendas through the states pose a serious challenge to conceptions of federalism grounded in distinctive state interests."); James A. Gardner, *The Myth of State Autonomy: Federalism, Political Parties, and the National Colonization of State Politics*, 29 J.L. & POL. 1, 39-42 (2013); Anthony Kammer, *Privatizing the Safeguards of Federalism*, 29 J.L. & POL. 69, 115 (2013).

169. *See* Julianna Pacheco, *The Social Contagion Model: Exploring the Role of Public Opinion on the Diffusion of Antismoking Legislation Across the American States*, 74 J. POL. 187, 188-89 (2012).

170. Bulman-Pozen, *Partisan Federalism*, *supra* note 24, at 1110.

171. Tiebout sorting, a "largely neglected [phenomenon] in mainstream constitutional theory," is a major source of heterogeneity in federalist systems. Adam B. Cox & Adam M. Samaha, *Unconstitutional Conditions Questions Everywhere: The Implications of Exit and Sorting for Constitutional Law and Theory*, J. LEGAL ANALYSIS 61, 63 (2013); *see also* MILLER & PAGE, *supra* note 28, at 17-25. States compete for citizens by offering different packages of rights, benefits, and burdens. Citizens make choices by "voting with their feet" about where to live and "sort" themselves among the different jurisdictions according to the states or localities whose packages best match their preferences. Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64 J. POL. ECON. 416, 418-20 (1956); *see also* Ken Kollman et al., *Political Institutions and Sorting in a Tiebout Model*, 87 AM. ECON. REV. 977, 978-79, 990 (1997). As citizens group geographically according to their preferences, states will become more heterogeneous in relation to one another, even as they become more homogeneous internally. *See* Paul W. Rhode & Koleman Strumpf, *Assessing the Importance of Tiebout Sorting: Local Heterogeneity from 1850 to 1990*, 93 AM. ECON. REV. 1648, 1655 (2003).

172. *See* BILL BISHOP, THE BIG SORT: WHY THE CLUSTERING OF LIKE-MINDED AMERICA IS TEARING US APART (2009). *Contra* Samuel J. Abrams & Morris P.

affect policy diversity too. As citizens divide themselves into internally homogeneous Red and Blue enclaves, the policy variation generated by the need for political compromise may decrease as polarization simultaneously narrows the political viability for a full range of policy options.[173]

At the same time, other dynamics operate to spur state policy diversity. State political cultures remain remarkably distinct,[174] and there is significant evidence to suggest that states continue to approach similar legal and policy questions in very different ways.[175] Federal programs that create space for policy discretion, like experimental grants, can encourage innovation and new approaches.[176] And federal gridlock has pushed national debates and political resources to the state level, shifting the influence of entrenched interest groups and creating space to implement policy experiments that would be politically impossible on a national scale.[177]

All of this suggests that a full account of how experimental federalism works requires greater attention to the larger forces that produce, maintain, and constrain meaningful differences among states, along with the myriad factors that drive policy activity at the state level.[178] It also suggests that law's role in defining experimental federalism's outcomes is far more extensive and nuanced than determining the boundaries of federal and state authority.[179]

Fiorina, *The Big Sort that Wasn't: A Skeptical Reexamination*, 45 PS: POL. SCI. & POL. 203 (2012).

173. *See* Gerken & Holtzblatt, *supra* note 24, at 88-89.

174. ANDREW GELLMAN, RED STATE, BLUE STATE, RICH STATE, POOR STATE: WHY AMERICANS VOTE THE WAY THEY DO 21-22 (2008)

175. *See* Ernest A. Young, *The* Volk *of New Jersey? State Identity, Distinctiveness, and Political Culture in the American Federal System* 66-87 (Feb. 24, 2015), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2552866.

176. DISTRICT REFORM SUPPORT NETWORK, PERSONALIZED LEARNING IN PROGRESS: CASE STUDIES OF FOUR RACE TO THE TOP DISTRICT GRANTEES' EARLY IMPLEMENTATION (2014).

177. *See* Adelman & Engel, *supra* note 24, at 1809-10, 1847-48; Bulman-Pozen, *Partisan Federalism*, *supra* note 24, at 1092-93, 1125-26.

178. *See* Adelman & Engel, *supra* note 24, at 1822.

179. Gerken & Holtzblatt, *supra* note 24, at 59-64.

Preemption doctrine and reinforcing state sovereignty under the Tenth Amendment are not the only vehicles for law to tinker with and alter federalism's experimental output.[180]

Law affects experimentation by shaping the way the game of state politics is played and the political, social, and economic trends that bring state policy preferences closer together or further apart.[181] Changes in constitutional doctrine have contributed to the recent rise of national interest groups pursuing multi-jurisdictional policy agendas and uniform model legislation in areas like immigration and voter ID.[182] Judicial deregulation of campaign finance laws, lobbying restrictions, and limits on political parties have created a fertile ground for national groups to influence state legislation with a multistate agenda.[183] Constitutional standards governing partisan gerrymandering remain elusive,[184] allowing for increased political polarization at the state level.[185] These dynamics at the intersection of politics and law affect policy heterogeneity within the system and play a large role in determining whether federalism lives up to Brandeis's experimentalist vision.

III. INTERDEPENDENCE AND EXPERIMENTAL FEDERALISM

From a complex adaptive systems perspective, heterogeneity is only half of the story. Federalism's emergent features and experimental capacity are also defined by interdependence: the ways that a system's components affect the behavior of other components.[186] While interdependence can take many forms,[187] the focus here is on informational

180. Bednar, *Nudging Federalism*, *supra* note 10, at 511-15.

181. *Id.*

182. Kammer, *supra* note 168, at 115.

183. *Id.* at 86.

184. *See* Vieth v. Jubelirer, 541 U.S. 267, 278-79 (2004).

185. *See* Samuel Issacharoff & Pamela S. Karlan, *Where to Draw the Line?: Judicial Review of Political Gerrymanders*, 153 U. PA. L. REV. 541, 574 (2004).

186. Lazer & Mayer-Schönberger, *supra* note 66, at 820.

187. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 507-08; Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 236. For example, the term interdependence might include "spillover" effects, where policy choices made by

interdependence and policy diffusion: the transfer of information about policy experiments and the spread of policies from state to state. These interstate connections affect the system's ability to exploit existing information and open up new avenues for exploration.[188]

A focus on interdependence and diffusion moves the study of experimental federalism away from its standard obsession with competing spheres of federal and state authority.[189] From this vantage point, individual states are not independent "islands,"[190] but instead operate as nodes in an interdependent system that creates and transfers information about policy experiments and choices.[191] As Robert Schapiro puts it, federalism consists of a set of "individual, autonomous units, linked by a network" with "multiple participants contributing to an unfolding, dynamic process."[192] The connections among nodes carry information about state-level policy successes and failures, as well as raw data about policy outcomes.[193]

Within interdependent systems, network architecture—the number and strength of the informational connections between the nodes—helps determine the system's overall behavior.[194] The likelihood that the nodes will exchange information, the accuracy of that information, the frequency of information transfer, the type of information exchanged,

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one state have positive or negative effects on the policy choices made by others. *See* Lazer & Mayer-Schönberger, *supra* note 66, at 837.

188. *See* Wiseman, *supra* note 15, at 1665-67.

189. *See* Rubin & Feeley, *supra* note 12, at 904-06, 933.

190. *See* BOUSHEY, POLICY DIFFUSION, *supra* note 116, at 29; *see also* Wiseman, *supra* note 15, at 1740-41.

191. Lazer, *Information and Innovation*, *supra* note 97, at 101-04; Corey Phelps et al., *Knowledge, Networks, and Knowledge Networks: A Review and Research Agenda*, 38 J. MGMT. 1115, 1117 (2012).

192. SCHAPIRO, *supra* note 15, at 5, 100; *see also* Gerken & Holtzblatt, *supra* note 24, at 102; Michal Shur-Ofry, *IP and the Lens of Complexity*, 54 IDEA 55, 58 (2014) (describing representation of complex systems as networks).

193. Lazer, *Information and Innovation*, *supra* note 97, at 53-54.

194. *See* THOMAS W. VALENTE, NETWORK MODELS OF THE DIFFUSION OF INNOVATIONS 60-61 (1995).

and the sequential order that information moves through the system all affect the choices made by individual nodes.[195]

In the business world, organizational design is critical to determining whether a firm will innovate.[196] Structural choices impose rules that determine the flow of information within the organization, the way individuals or teams spend their time, the resource costs imposed by the innovation process, and how the firm responds to volatile business environments.[197] In turn, system designers that seek to promote innovation must think carefully about whether and how each component should communicate with other components.[198] For example, within a research and development department, organizational designers must determine whether different research teams working on the same problem should share information with one another, how closely they should work together, and the effect of those connections on the department's ability to innovate.

Federalist systems are no different. The rules that govern their structure and design help determine the states' experimental output, creating incentives for political actors to make choices that affect the system's larger experimental objectives.[199] The institution or removal of barriers to information flow can change interaction patterns within the system and alter the system's capacity for experimentation and innovation.[200] In particular, interdependence helps determine whether a federalist system achieves a critical

195. *See* Phelps et al., *supra* note 191, at 1122-29.

196. *See* Stephen J. DeCanio et al., *The Importance of Organizational Structure for the Adoption of Innovations*, 46 MGMT. SCI. 1285, 1285 (2000).

197. *See, e.g.*, *id.* at 1285; George Westerman et al., *Organization Design and Effectiveness over the Innovation Life Cycle*, 17 ORG. SCI. 230, 230-31 (2006).

198. *See* Daniel Enemark et al., *Knowledge and Networks: An Experimental Test of How Network Knowledge Affects Coordination*, 36 SOC. NETWORKS 122, 122, 132 (2014).

199. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 511-14; Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 242-43.

200. *See* AXELROD & COHEN, *supra* note 33, at 78.

equilibrium for optimal performance: a balance between exploration and exploitation.[201]

A. *Exploration and Exploitation*

Organizational systems that face difficult problems confront a fundamental choice about how to solve them. They can try to address the problem through *exploitation* by investing in and emphasizing existing solutions and knowledge.[202] Exploitation-based strategies typically involve efforts to learn from what the organization already knows by using easily accessible information, making incremental improvements to current policies, and relying on existing paradigms and routines.[203] Alternatively, the system can address the situation through *exploration* by using its time and resources to discover and implement new solutions.[204] Exploration often means learning through varied approaches, seeking knowledge that may not be easily available, experimentation, and breaking from existing patterns.[205]

Both exploitation and exploration come with benefits and drawbacks. When an organizational system (like a state government) chooses to exploit existing solutions, it gains predictability and stability while reducing the political risks that come with policy change.[206] Moreover, it avoids the costs

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201. *See* Christina Fang et al., *Balancing Exploration and Exploitation Through Structural Design: The Isolation of Subgroups and Organizational Learning*, 21 ORG. SCI. 625, 625-28 (2010); Dovev Lavie et al., *Exploration and Exploitation Within and Across Organizations*, 4 ACAD. MGMT. ANNALS 109, 132 (2010).

202. *See* James G. March, *Exploration and Exploitation in Organizational Learning*, 2 ORG. SCI. 71, 85 (1991).

203. *See* Anil K. Gupta et al., *The Interplay Between Exploration and Exploitation*, 49 ACAD. MGMT. J. 693, 694 (2006).

204. *Id.*

205. *See id.* at 694-95. The literature on exploration, exploitation, and innovation is extensive. *See, e.g.*, Mary J. Benner & Michael L. Tushman, *Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited*, 28 ACAD. MGMT. REV. 238 (2013); Carlisle & McMillan, *supra* note 57; DeCanio et al., *supra* note 196; Fang et al., *supra* note 201; Lavie et al., *supra* note 201; March, *supra* note 202; Westerman et al., *supra* note 197.

206. *See* Lavie et al., *supra* note 201, at 115-16.

and risks involved in searching for and implementing a new and experimental policy. Yet exploitation carries its own set of problems. Systems that rely exclusively on exploitation can find themselves stagnating around suboptimal solutions, experiencing competitive disadvantage, or becoming obsolete when existing approaches cannot adapt to internal or external changes.[207] Exploitation can also lead to homogenization and "groupthink," as decision-makers become "locked in" to existing solutions over time and converge around a single viewpoint.[208]

Like exploitation, exploration-based strategies have their own cost-benefit calculation. On one hand, exploration allows systems to maintain a diverse approach to problem solving, as multiple organizational sub-units pursue different experimental strategies.[209] Exploration can also help systems adapt to and survive dynamic change, as the pursuit of multiple innovative solutions increases the possibility that at least one solution will prove successful in a new environment.[210] On the other hand, exploration can prove costly and risky, and systems can lose the benefits associated with convergence around a single stable solution: economies of scale, enhanced efficiency through coordination, increased competence, and predictability. It can also prove chaotic, as the permanent quest for new ideas leads to a state of "eternal boiling," where good ideas are constantly washed away in a new wave of change.[211]

Systems achieve long-term optimal performance by finding a balance between exploration and exploitation.[212] A system that expends all its resources to constantly explore new policy experiments risks inefficiency because it fails to

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207. *See* Fang et al., *supra* note 201, at 625-27.

208. Bill McKelvey et al., *Re-thinking Kaufmann's NK Fitness Landscape: From Artifact and Groupthink to Weak-Tie Effects*, 32 HUM. SYS. MGMT. 17, 25 (2013).

209. *See* Fang et al., *supra* note 201, at 625-26; March, *supra* note 202, at 72.

210. Bednar, *Subsidiarity & Robustness*, *supra* note 21, at 239.

211. AXELROD & COHEN, *supra* note 33, at 43-44.

212. *See* Lavie et al., *supra* note 201, at 128-29; March, *supra* note 202, at 71. *But see* Carlisle & McMillan, *supra* note 67, at 3 (suggesting the idea of "balance" may be problematic from a complex adaptive systems perspective).

fully exploit the resources it has,[213] while a system with too much exploitation risks obsolescence and rigidity.[214]

The ideal system pursues both strategies simultaneously, gaining stability and efficiency by making the most of existing solutions and information, while also exploring new strategies that lead to growth and adaptation.[215] Yet finding this balance can be challenging, since there is often a direct tradeoff between the two approaches—an investment in exploitation usually involves diverting resources from exploration, and vice versa.[216]

B. *Interdependence and the Balance Between Exploration and Exploitation*

The search for the ideal "balance" between exploration and exploitation is, at its root, a design challenge. The number and strength of the connections between the system's nodes influences the system's overall approach to problem solving. In turn, different choices about network architecture affect the system's performance[217] and can nudge the system toward different points on the exploration-exploitation spectrum.[218] For experimental federalism, this requires a focus on the informational and policy links between states, and the ways that those connections help move the system towards an optimal balance between exploration and exploitation.

There are at least three features of American federalism that make it challenging to arrive at or impose a normative theory that will move the system towards that perfect balance, even if it's possible to figure out where that balance

213. *See* Bednar, *Subsidiarity & Robustness*, *supra* note 21, at 239.

214. *See* Lavie et al., *supra* note 201, at 115-16. Note that because policy choices are often path dependent, systems that do nothing but exploit become more and more locked into their earlier policy choices, making it more and more impossible to move in alternative directions. *Id.* at 125.

215. *See* Benner & Tushman, *supra* note 205, at 238, 252; Gupta et al., *supra* note 203, at 697; March, *supra* note 202, at 71-72.

216. AXELROD & COHEN, *supra* note 33, at 44-45.

217. *See* Enemark et al., *supra* note 198, at 122, 132.

218. *See* Lavie et al., *supra* note 201, at 122-23.

is. First, federalism exhibits characteristics of both hierarchical systems, where a centralized body dictates the connections between nodes,[219] and self-organizing networks, where individual nodes make their own choices about connections.[220] The federal government is an active player in establishing and maintaining interstate linkages, though its power is circumscribed by legal and political limitations. This makes it hard to use a centralized legal approach to impose an overall architecture on the system: the federal government has some power to "nudge" the experimental system towards exploration or exploitation, but the system's connections are subject to decisions made by thousands of independent actors operating at the sub-federal level that may or may not choose to cooperate.[221]

Second, the connections are dynamic—ties between states change based on political forces, and their strength can vary over time and on an issue-by-issue basis.[222] Even if certain states do not normally communicate with one another, information and policies can spread across state borders quite rapidly when attention to a particular issue becomes nationalized, like same-sex marriage or medical marijuana.[223] This makes it particularly difficult to think about the exploration-exploitation balance in a uniform, one-size-fits-all way, because at any given time, the system's behavior may vary depending upon the issue and political dynamics.[224]

Third, connections between states are often outside the control of state governments. Private, non-governmental actors like political parties, interest groups, and policy

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219. *See* Graeme Boushey, *Punctuated Equilibrium Theory and the Diffusion of Innovations*, 40 POL'Y STUD. J. 127, 130 (2012) [hereinafter Boushey, *Punctuated Equilibrium Theory*] (listing studies showing influence of federal mandates, grants, and agenda setting on state policy adoption).

220. *See* Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 247-49.

221. *See* Bednar, *Nudging Federalism*, *supra* note 10, at 512; Bednar, *Subsidiarity and Robustness*, *supra* note 21, at 242-43.

222. *See* KARCH, *supra* note 6, at 196-97.

223. Boushey, *Punctuated Equilibrium Theory*, *supra* note 219, at 132, 142.

224. *Id.* at 142; Nicholson-Crotty, *supra* note 116.

entrepreneurs are the primary providers of interstate linkages, facilitating the transfer of information about policy experiments across state borders and coordinating multi-state political efforts at policy innovation.[225] Any efforts to "nudge" the exploration-exploitation balance through the creation or removal of links between nodes requires the cooperation of diverse and powerful political forces beyond the control of any central authority.

These realities make it difficult to be prescriptive about the ideal network architecture for experimental federalism, and this Article will not try. But it is possible to examine how interdependence affects the system's experimental bias towards exploration or exploitation in order to better understand the system's overall behavior.[226]

C. *Strong Ties vs. Weak Ties*

When systems lack centralized direction, interdependence among the system's components exerts a powerful influence on how the system behaves. In particular, interdependence and network ties can nudge a system's experimental behavior towards either exploitation or exploration.[227]

Network theorists emphasize the difference between "strong" and "weak" ties between nodes.[228] In "strong tie" or dense networks, nodes maintain connections to a large number of other nodes in the network. Information flows quickly and directly, and the ability to gather and aggregate information is democratically dispersed throughout the system.[229] These networks gather a lot of immediate feedback

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225. *See* BOUSHEY, POLICY DIFFUSION, *supra* note 116, at 29-30; Amanda C. Leiter, *Fracking as a Federalism Case Study*, 85 U. COLO. L. REV. 1123, 1126-29 (2014); Michael Mintrom, *Policy Entrepreneurs and the Diffusion of Innovation*, 41 AM. J. POL. SCI. 738, 739-41, 765 (1997).

226. *See* David Lazer & Allan Friedman, *The Network Structure of Exploration and Exploitation*, 52 ADMIN. SCI. Q. 667 (2007).

227. *See id.*

228. *See, e.g.*, Mark S. Granovetter, *The Strength of Weak Ties*, 78 AM. J. SOC. 1360 (1973).

229. *See* Phelps et al., *supra* note 191, at 1124.

about different choices and can prove very robust in the face of change by creating redundancies among nodes in the network, like a power grid that can find many different ways to provide electricity when a single connection goes down.[230] By contrast, "weak tie" networks have a limited number of connections between nodes. Information spreads more slowly and less efficiently, as each node is limited in its ability to send and receive information.

From an exploration/exploitation perspective, strong ties push systems towards exploitation-based strategies, convergence, coordination, and homogeneity.[231] As one node arrives at a best-available solution, "strong ties" make it easy for other nodes to learn about it and rapidly converge on that solution.[232] For example, in a federalism context, strong informational ties between states can facilitate policy diffusion, a well-documented phenomenon where policy innovations spread from state to state.[233]

Weak ties, on the other hand, tend to push the system towards exploration-based approaches, heterogeneity, and divergence.[234] When connections among nodes are weak, information about other experiments is limited and non-sequential, which can make it more difficult to determine if other nodes have found better solutions.[235] As a result, nodes in "weak tie" networks tend to move towards developing their own innovations rather than looking to solutions produced by other nodes.[236] Moreover, maintaining weak ties or distance among nodes allows the system to preserve diverse approaches to problem solving over a longer period of time.[237] This can prove helpful for difficult problems, where it may take time to determine the best available solution. For example, a federalist system with a critical mass of isolated

230. *See* Bednar, *Subsidiarity & Robustness*, *supra* note 21, at 235.

231. *See* Phelps et al., *supra* note 191, at 1128, 1133.

232. *See* Lazer, *Information and Innovation*, *supra* note 97, at 60, 61, 64.

233. *See* sources cited *supra* note 62 and accompanying text.

234. *See* Lazer, *Information and Innovation*, *supra* note 97, at 61.

235. *See id.*

236. Lazer, *Regulatory Capitalism*, *supra* note 107, at 61.

237. *See* Fang et al., *supra* note 201, at 627.

or slow-learning states might actually end up improving its overall performance due to its ability to prevent premature convergence and maintain diverse approaches to problem solving over a longer period of time.[238]

D. *Interdependence and Information Deficits*

Within federalist systems, the relationship between interdependence and the exploitation-exploration continuum can have real implications for policy initiatives designed to improve experimental outputs and innovation. For example, consider how changing interdependencies might affect the problem of information deficits in state policy experimentation.

Information flow is often described as a necessary prerequisite for policy experimentation.[239] In order to make good choices about policy design, state officials need information about what other states are doing and the effectiveness of available alternatives. Yet, for different reasons, including concerns about free-riding and inadequate incentives, states often do not produce sufficient or accurate information about their experiments, or will fail to seek out information about existing experiments in other states.[240] This leaves state policy makers with an incomplete picture of the available policy options, and limits federalism's capacity to locate and disseminate the most successful policy experiments.

In order to correct for information deficits, several federalism scholars have called for the federal government to operate as a clearinghouse or "information portal" for state policy experimentation, standardizing the kinds of information that states share and facilitating the production, distribution, and comparison of information about different policy approaches.[241] This would effectively strengthen ties

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238. *See id.*

239. *See* Stephenson, *supra* note 79, at 1423-27; Wiseman, *supra* note 15, at 1679-81.

240. *See* Wiseman, *supra* note 15.

241. *See id.*; *see also* Burger, *supra* note 62; Dorf & Sabel, *supra* note 2.

within the experimental network by turning the federal government into an information "hub," and change the existing interdependence dynamics within the system.[242]

While there are certainly some experimental benefits to facilitating greater interstate communication through the creation of stronger ties,[243] complexity theory raises some potential concerns about how creating greater state-level information interdependence through federal intervention would affect the system's overall experimental behavior.

When a network creates more or stronger ties between nodes, the system's overall innovation strategy tilts towards exploitation. When making decisions, nodes within a well-connected system can become increasingly reliant on already available information and allocate fewer resources to new experiments and innovation. Informational interdependence, whether created by the states themselves, facilitated by interest groups, or imposed by the federal government, can actually lead to less overall experimentation as states design experiments with the information that is closest to them and stop seeking out untested frontiers.

Increased informational interdependence can also limit the system's ability to realize the experimental benefits of diversity.[244] Systems that adopt an exploitation-based strategy tend to become more homogenous due to self-reinforcing feedback mechanisms that become even stronger the more the system relies upon the same set of information. As a result, strong-tie networks risk premature convergence around short-term solutions that may prove sub-optimal in the long-term,[245] or solutions based on bad or inaccurate

242. *See generally* Melissa A. Schilling & Christina Fang, *When Hubs Forget, Lie, and Play Favorites: Interpersonal Network Structure, Information Distortion, and Organizational Learning*, 35 STRATEGIC MGMT. J. 974 (2014).

243. This assumes that states are actually responsive to the information they receive about policies adopted in other states. Shipan & Volden, *The Mechanisms of Policy Diffusion*, *supra* note 62, at 840. *But see* KARCH, *supra* note 6, at 105-07, 109, 111.

244. *See* Lazer & Friedman, *supra* note 226, at 686.

245. *See id.* at 678-80.

information that flows quickly through the system.[246] Moreover, by making it easier and cheaper for a state to obtain information about other states' experiments in a homogeneous environment, the risk of free-riding increases significantly.[247]

Finally, even within strong tie networks, nodes are selective about who they choose to listen to: just because the federal government invests in the production and dissemination of information does not mean that states will actually use it. In particular, states pay more attention to information from places that are similar to them. This phenomenon, known in network theory as "homophily,"[248] places constraints on the ability of strong tie or hub networks to convey information, and there is significant evidence to suggest that interstate ties are homophilous.[249] States that share certain core traits, like ideological and partisan preferences, are more likely to learn from each others' policies.[250] While creating information hubs may indeed result in cross-pollination of ideas outside of these sub-groups,[251] homophilous links forged from the "bottom up" by the nodes themselves may in practice prove to be immune to the ideas promoted by a centralized information network imposed from the top down.[252] This is of particular concern in a polarized political environment where states may be particularly inclined to discount good information based on the partisan affiliations of its source, and more likely to prioritize information from states with similar political views.

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246. *See* Lazer, *Regulatory Capitalism*, *supra* note 107, at 62; *see also* Deborah E. Gibbons, *Network Structure and Innovation Ambiguity Effects on Diffusion in Dynamic Organizational Fields*, 47 ACAD. MGMT. J. 938 (2004).

247. *See* Galle & Leahy, *supra* note 62.

248. *See* Adam M. Kleinbaum et al., *Discretion Within Constraint: Homophily and Structure in a Formal Organization*, 24 ORG. SCI. 1316, 1316 (2013).

249. Homophily has been found in a wide variety of relationship types and in different context. *See id.* at 1317.

250. Lawrence J. Grossback et al., *Ideology and Learning in Policy Diffusion*, 32 AM. POL. RES. 521 (2004).

251. *See* ALBERT-LÁSZLÓ BARÁBASI, LINKED 64 (2014).

252. *But see* Boushey, *Punctuated Equilibrium*, *supra* note 219, at 142 (arguing that federally mandated innovation causes rapid policy diffusion).

This does not mean that information sharing within a network is a bad thing or that there is no role for the federal government to play in incentivizing or structuring state policy experimentation. It only suggests that informational interdependence can alter a system's behavior in ways that can advance as well as diminish its experimental performance. When links between states move a system too far towards exploitation or affect the system's overall level of heterogeneity, limits on information sharing may actually help the system produce more and better policy experiments.

CONCLUSION

Complexity reminds us that policy devolution does not, in and of itself, necessarily result in more or better experimentation. Regardless of how authority is divided between federal and state governments,[253] effective experimentation is often contingent on heterogeneity and interdependence among the state policy laboratories. Heterogeneity helps experimental systems overcome certain obstacles to effective problem solving, while simultaneously creating other difficulties. Interdependence helps influence whether a system adopts an experimental approach that emphasizes exploitation or exploration, along with all the attendant costs and benefits.

The recognition of heterogeneity and interdependence as critical variables for federalism's experimental performance has implications for constitutional theory beyond deepening our knowledge of how the system works. First, it suggests the need to move away from a continual focus on federal-state

253. For research addressing how decisions about centralization and decentralization affect policy experimentation, see, e.g., John C. Butler & Jovan Grahovac, *Learning, Imitation, and the Use of Knowledge: A Comparison of Markets, Hierarchies, and Teams*, 23 ORG. SCI. 1249 (2012); Kollman et al., *Decentralization*, *supra* note 142; Nicolaj Siggelkow & Daniel A. Leventhal, *Temporarily Divide to Conquer: Centralized, Decentralized, and Reintegrated Organizational Approaches to Exploration and Adaptation*, 14 ORG. SCI. 650 (2003); Nicolaj Siggelkow & Jan W. Rivkin, *Speed and Search: Designing Organizations for Turbulence and Complexity*, 16 ORG. SCI. 101 (2005); Nicolaj Siggelkow & Jan W. Rivkin, *When Exploration Backfires: Unintended Consequences of Multilevel Organizational Search*, 49 ACAD. MGMT. J. 779 (2006); Koleman S. Strumpf, *Does Government Decentralization Increase Policy Innovation?*, 4 J. PUB. ECON. THEORY 207 (2002).

interactions and boundaries. Experimental federalism needs a fuller account of the political dynamics that drive policy decisions at the state level, the nature of interstate interactions and relationships, the forces that drive states closer together or further apart, and the ways that constitutional doctrine nudges state-level political behavior to become more uniform, polarized, or diverse.

Second, it underscores how difficult it is to be prescriptive about using law to improve federalism's experimental outcomes. By their very nature, complexity and emergence can make it difficult to identify causal relationships within the system and to fully anticipate the effects of legal or institutional reform.[254] Moreover, if systemic heterogeneity and interdependence are primarily a function of politics, law may prove quite limited in its ability to alter the well-established behavior of powerful political forces that drive the experimental system.

Finally, complexity suggests a broader vision of experimental federalism's normative goal. Complex adaptive systems achieve a competitive advantage over more hierarchical structures through their ability to survive and adapt in the face of change. When it works, experimental federalism allows the system to simultaneously explore and exploit at the same time, and to seek out the optimal spot on the continuum between rigidity and randomness. The ultimate goal of experimental federalism is not just improved policy through innovation, but a system that can survive and thrive in a dynamic and changing world.

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254. *See* PAGE, DIVERSITY AND COMPLEXITY, *supra* note 20, at 31-33; J.B. Ruhl & Daniel Martin Katz, *Measuring, Monitoring, and Managing Legal Complexity*, 100 IOWA L. REV. (forthcoming 2015), *available at* http://ssrn.com/abstract=2566535.