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THE NEW 'CLUSTER MOMENT': HOW REGIONAL INNOVATION CLUSTERS CAN FOSTER THE NEXT ECONOMY

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EXECUTIVE SUMMARY

Twenty years after Harvard Business School professor Michael Porter introduced the concept to the policy community and 10 years after its wide state adoption, clusters—geographic concentrations of interconnected firms and supporting or coordinating organizations—have reemerged as a key tool and rubric in Washington and in the nation's economic regions.

After a decade of delay, the executive branch and Congress have joined state and local policymakers in embracing "regional innovation clusters" (RICs) as a framework for structuring the nation's economic development activities.

At the state level, governors and gubernatorial candidates of both parties are maintaining or stepping up their longstanding interest.

And additionally, a broad range of business leaders, mainstream commentators, and policy analysts have been calling in the wake of the recent recession for a different kind of growth model that depends less on bubbles and consumption and more on the production of lasting value in metropolitan economies and the super-productive clusters within them.

All of which, at a moment of deep economic uncertainty, makes it appropriate to revisit the cluster paradigm and consider its special relevance at a moment of deep economic uncertainty, fiscal crisis, partisan gridlock, and necessary governance reform.

What explains clusters' renewed popularity? To be sure, some of the concept's new and bipartisan relevance owes to its sound non-partisan concern with the mechanics of value-creation in local economies, whether metropolitan or rural, high-tech or manufacturing. And it's true that as a matter of policy action clusters—ranging from the famous Silicon Valley technology cluster to the Vermont cheesemaking cluster—are all about synergies and efficiencies, and don't tend to cost too much.

But what is most timely beyond all that may be the possibility that the new prominence of regional innovation clusters reflects something deeper: a positive interest in locating a more grounded, realistic way to think about the economy and development efforts so as to put both on a more productive footing.

In this setting, the new cluster discussions redirect attention, analysis, and policymaking to the more grounded, day-to-day interactions by which real companies in real places complete transactions, share technologies, develop

innovations, start new businesses—and yes, create jobs and locate workers. To that extent, clusters—whether of airplane manufacturing in Wichita or cleantech in Colorado or biomedical innovation in Cleveland—represent an antidote to the nation's recent economic history of bubbles and consumption and also a framework for recognizing and bolstering the real-world variety and dynamism of regional economies. Hot spots of productivity and collaboration as well as competition, clusters are the locations most likely to deliver a new economy that is export-oriented, lower carbon, innovation-driven and so opportunity and prosperity rich.

Hence this policy note: Intended to probe the importance of industry clusters and the appropriate role of cluster-oriented policy action at a time of federal experimentation, this paper explores the new relevance of the cluster paradigm during the present "cluster moment" and suggests some watchwords for its future use. Ultimately, the paper suggests several general principles that should discipline future deployment of cluster strategies and suggests some priorities for leadership and partnership on the part of the major tiers of government.

Most notably, the following pages find that:

1. **Clusters and cluster approaches hold out substantial attractions as the nation seeks to rebuild a damaged economy.** Clusters, in this respect, have emerged as a major focus of economic and policy discussion just now by dint of their demonstrated practical impact, their value in paradigm discussions, and their potential utility in policy reform. Most notably:

    - ***Pointing to impact, new research confirms that strong clusters tend to deliver positive benefits to workers, firms, and regions.*** It is now broadly affirmed that strong clusters foster innovation through dense knowledge flows and spillovers; strengthen entrepreneurship by boosting new enterprise formation and start-up survival; enhance productivity, income-levels, and employment growth in industries; and positively influence regional economic performance

    - ***As a matter of paradigm, clusters reflect the nature of the real economy.*** Cluster frameworks, in this respect, highlight the real-world interactions, connections, transactions, and dealings of real firms after a period of delusion and over-simplification. For example, the cluster paradigm emphasizes the regional underpinnings of the national economy; highlights the unique variations and specializations that define productive local economies; and focuses attention on the myriad actors and the

dynamics of their exchanges and interactions that give rise to new innovations and jobs. Clusters, in short, provide a timely and useful lens through which to clarify what matters in economic affairs

- ***As a matter of policymaking, clusters provide a framework for rethinking and refocusing economic policy***. The cluster paradigm, finally, yields practical insights that can help policymakers get their priorities right and maximize the impacts of their efforts at a time of constrained resources. Along these lines, cluster thinking appeals because it: puts the policy focus on regions; draws attention to the grainy, real-world dynamics of regional economies; takes into account the need for local discretion across regions and industries; and provides a vehicle for coordinating fragmented policy offerings to improve efficiency

2. **When it comes to policymaking leaders at all levels should adhere to a set of core general principles when pursuing cluster-based economic development strategies**. Regional innovation clusters are a fact of economic life, but their promotion through government or quasi-government initiatives must be pursued judiciously—through data-disciplined, targeted interventions. To guide such effort going forward at least six general watchwords bear consideration. Namely:

    - ***Don't try to create clusters.*** Clusters can't be created out of nothing and cluster initiatives should only be attempted where clusters already exist. The preexistence of a cluster means that an industry hotspot has passed the market test. By contrast, efforts at wholesale invention will likely be fraught with selection issues, inefficiency, and probable failure and waste

    - ***Use data and analysis to target interventions, drive design, and track performance.*** Cluster strategies or policy interventions—when attempted—should be grounded in rigorous empirical information and analysis so that decisionmakers can make objective assessments about the nature, competitive prospects, and specific needs of different regional industry concentrations. Cluster strategies also need to be held accountable so performance measurement is critical

    - ***Focus cluster initiatives on clusters where there is objectively measured evidence of under-capacity*****.** Work to upgrade an identified cluster should be tightly focused on attacking specific,

documented constraints, institutional deficiencies, or resource shortcomings

- ***Maximize impact by leveraging cluster-relevant preexisting approaches, programs and initiatives.*** Specific, targeted cluster-oriented initiatives are clearly justifiable, but equal value and added impact may well come from drawing other, more generally relevant programs into the cluster orbit. For example, at the federal level programs like the R&D tax credit as well as SBI and SBTT grants, workforce training programs, and small business finance may all be rightly viewed as "cluster" programs, just as banking regulations, tax credits for venture capital, and education policy may be at the state level. In this way, "clusters" and cluster strategies are less a specific program than a framework through which to shape and coordinate disparate policies

- ***Align efforts "vertically" as well as horizontally.*** The cluster paradigm can—and should—be used to organize the disconnected policy offerings of any one level of government in service of clusters' needs in a region, but it also provides a framework for coordinating them up and down the tiers of federalism to avoid policy conflict, redundancy, or missed opportunities for synergy

- ***Let the private sector lead.*** Clustering is a dynamic of the private economy in the presence of public goods. Cluster strategy should be pursued with humility as a matter of supporting, connecting, filling gaps, and removing obstacles to private enterprise while making sure certain public and quasi-public goods are available

3. **While keeping these principles in mind, all tiers of the nation's federalist system have roles to play in advancing the co-development a new cluster-informed stance in U.S. economic policy**. At a time of near- and longer-term economic crisis, a rough division of labor among the levels of government can be envisioned:

    - ***Federal policymakers can provide a rich base of information and related foundational resources for cluster practitioners nationwide.*** Going forward, the federal government should move aggressively to build the information base necessary for cluster activity and policymaking; create effective forums for best practice sharing; enhance the capacity of regional cluster intermediaries with planning and other assistance; employ cluster paradigms on major national challenges; coordinate disparate cluster-relevant

programs; and ensure the overarching cluster effort is visibly prominent

- ***State policymakers should strategically invest their own resources in cluster-led economic development.*** States can make clusters a central component of economic development planning; target investments strategically to clusters of state significance; and adjust metropolitan governance to ease regional collaboration

- ***Regional leaders should identify cluster challenges and coordinate cluster actors.*** Regional intermediaries should work to identify and describe local clusters, identify their binding constraints, and facilitate regional joint action to implement needed exchanges and initiatives

- ***Local policymakers should bring to tools to influence on-the-ground implementation of cluster-oriented economic development.*** They should manage zoning and permitting issues to benefit the physical infrastructure in which clusters exist, and they should keep an eye out for the broader demographic and social context in which new industry clusters might form and to which existing ones must adjust

* * *

In sum, cluster thinking and cluster strategies have the potential to accelerate regional economic growth and assist with the nation's needed economic restructuring, but they are more a paradigm than a single program. In that sense, the opportunities that a cluster policy framework provides for delivering impact, clarifying economic priorities, and coordinating disparate programmatic efforts will only grow more important in the coming era of intensified competitive pressures and tightened resources.

I. INTRODUCTION

Twenty years after Harvard Business School professor Michael Porter fully introduced the concept to the policy community and 10 years after the most up-to-date state and local development professionals grew weary of the concept, clusters—geographic concentrations of interconnected firms and supporting or coordinating organizations—have reemerged as a key tool and rubric in Washington and in the nation's economic regions.

After a decade of delay, the executive branch and Congress have joined state and local policymakers in embracing "regional innovation clusters" (RICs) as a new framework for structuring the nation's economic development activities.

At the state level, governors and gubernatorial candidates of both parties are maintaining or stepping up their longstanding interest.

And additionally, a broad range of business leaders, mainstream commentators, and policy analysts have been calling in the wake of the recent recession for a different kind of growth model that depends less on bubbles and consumption and more on the production of lasting value in metropolitan-area economies and super-productive clusters within them.[1]

All of which makes it appropriate to revisit the cluster paradigm and consider its special relevance at a moment of deep economic uncertainty, fiscal crisis, partisan gridlock, and necessary governance reform.

And here it is clear that something significant is transpiring. More than a case of belated federal uptake, the new prominence of clusters actually reflects something deeper: an effort to locate a more grounded, realistic way to think about the economy and development efforts so as to put both on a more productive and sustainable footing.

Simply put, clusters—such as the Silicon Valley technology cluster or the Vermont cheesemaking cluster—represent an antidote to nation's recent economic malaise.

For three decades, the nation has relied on a series of bubbles that have generated glitzy short-term growth but not truly productive or sustainable prosperity.[2]

Most recently, the collapse of the massive housing and financial sector bubble in 2008, the ensuing deep recession, and the present halting recovery revealed the dysfunction of a U.S. economy that has gone badly awry.

Not only has a focus on the short term led the nation to under-invest in the drivers of sustainable growth: innovation inputs like R&D; physical and technological infrastructure; education; clean energy.[3] What is more, the recent crack-up revealed an economy that had become addicted to domestic consumption and debt, dominated by financial manipulation, disdainful of production, and obtuse about the real world, local, and practical processes of creating value and advantage.[4]

In contrast, the new cluster discussions redirect attention, analysis, and policymaking to the more grounded, day-to-day interactions by which real companies in real places complete transactions, share technologies, develop innovations, start new businesses, produce new jobs, and locate employees.[5]

An industry cluster, in this respect, is a geographic concentration of firms, suppliers, coordinating entities, and related institutions in a particular field that arises and grows because of the mutual benefits they derive from proximity and the powerful synergies it makes possible, whether of knowledge exchange, mutual access to skilled labor pools, or the use of shared public goods. Thanks to those synergies and efficiencies, clusters are signal features of the "real" economy that have the power to enhance the performance of the economy; deliver higher returns on taxpayer investments in economic development; and enlist bipartisan support at a time of gridlock.

On the latter two fronts, the relatively low cost and likely efficiency returns of cluster strategies (along with their Republican lineage and pragmatic concern with the mechanics of value creation in local economies) make them an attractive policy option at a time of tight budgets and partisan tension.

Regional Innovation Clusters and Cluster Initiatives Defined

Regional innovation (or industry) clusters are geographic concentrations of interconnected businesses, suppliers, service providers, coordinating intermediaries, and associated institutions like universities or community colleges in a particular field (e.g., information technology in Seattle, aircraft in Wichita, and advanced materials in Northeast Ohio). By facilitating such dynamics as labor market pooling, supplier specialization, and knowledge spillovers, industry clusters benefit all sorts of firms and regions by enhancing the local and innovation potential, encouraging entrepreneurship, and ultimately promoting growth in productivity, wages, and jobs.

Separate and distinct, **cluster initiatives** are formally organized efforts to promote cluster growth and competitiveness through collaborative activities among cluster participants. Some cluster initiatives and **cluster initiative programs** supporting multiple initiatives are run by governments. Cluster initiatives may sponsor education and training activities, encourage relationship building, or facilitate market development through joint market assessment and marketing, among many others.

For more information, see –
Karen Mills, Elisabeth B. Reynolds, and Andrew Reamer, "Clusters and Competitiveness: A New Federal Role for Stimulating Regional Economies," (Washington: Brookings Institution, 2008).

Michael E. Porter, "Location, Competition, and Economic Development: Local Clusters in a Global Economy," *Economic Development Quarterly* 14 (1) (2000): 15–34.

But what matters most is the simple economic fact of clusters. Thanks to clusters, firms, regions, and the nation are more productive than they might otherwise be. As a result of clusters, millions of American workers, firms, and regions are enjoying higher wages, more competitive industries, more innovation, and more successful entrepreneurship than they might otherwise.

In fact, through the efficiencies and synergies of clusters, numerous U.S. regions are already engaged in constructing a more export-intensive, lower-carbon, and innovation-fueled economy here in America.

In Wichita, for example, the 40,500 workers employed by the 120 establishments in Wichita's aircraft cluster helped the region export nearly 28 percent of the metro area's gross metropolitan product to foreign countries in 2008, a figure more than two and one-half times higher than the national average.[6]

In Colorado, the “green” economy is taking shape along the Front Range where renewable energy research, manufacturing, and production employ 17,000 people in 1,500 different clean energy companies, bolstered by specialized institutions like the National Renewable Energy Laboratory and the Ecotech Institute, the nation’s first private, two-year college aimed specifically at green workforce training. [7]

And for that matter, the “innovation economy” is well under way in Northeast Ohio, where more than 600 firms now comprise a biomedical cluster which grew at an annualized rate of 7.4 percent from 2003 to 2008 and in 2008 alone attracted $395 million in venture capital and National Institutes of Health (NIH) funding.[8] The implication: One way to accelerate the emergence of the next economy in America may well be to strengthen the nation’s varied regional innovation clusters.

Yet that is not all. Beyond their importance as a practical fact of economic development, clusters provide a powerful, comprehensible paradigm for understanding what matters in economic life and organizing policy.

Along these lines, cluster concepts provide a useful framework through which to align federal, state, and local economic policy with local economic reality and then to organize policy reform.

To be sure, the U.S. has managed to generate an array of strong clusters despite the near absence of federal-government programs to support them (and in the presence of an irregular patchwork of state offerings) and may never embrace the strong central-government cluster programs of many European and Asian countries. Yet even so, this nation may well be moving toward a distinctively American cluster stance in which the states and regions act more forcefully while the national government focuses on maintaining sound economic fundamentals, providing comprehensive cluster data, and better aligning disparate preexisting programs with the cluster paradigm.

In any event, globalization, increased competitor-state policy activism, and the current economic crisis are all helping to make clusters an important framework for working out a pro-market, pro-productivity stance that avoids old-style “industrial policy” but nevertheless gives government an active role in fostering U.S. competitiveness. After all, through the natural and fostered emergence of diverse, locally-embedded clusters of excellence the nation can compete aggressively without slipping into directly “picking winners.” Likewise, through the bottom-up development of strong, place-based clusters that nation stands a better chance to build unique new industries that will be harder to off-shore.

Hence this policy note: Intended to review the importance of industry clusters and several advantages of cluster-oriented policy and practice at a time of federal program experimentation and continued economic uncertainty, the following pages explore the new relevance of cluster policy during the present "cluster moment."

To that end, the next section of the paper examines the fundamental differences of cluster frameworks from conventional economic policy to enhance national competitiveness. A section after that suggests some of the virtues of cluster frameworks and policy at the present juncture, and then another section proposes some principles for making the most of the present "cluster moment" en route to highlighting top ways the three major tiers of U.S. governance might co-produce a cluster-focused economic development push. A final section concludes.

In sum, the main takeaway here is simple: Clusters hold out practical value for businesses, workers, and policymakers alike as all seek lasting new sources of productive growth at a moment of economic uncertainty.

II. THE 'MISSING MIDDLE,' 'BLACK BOXES,' AND CLUSTERS

The world may be "flat," as Thomas Friedman famously concluded, but the most salient spatial reality of modern economies is actually their "spikey" concentration in a relatively small number of particular places.[9]

This concentrated reality is, first of all, arithmetic. In 2008, for example, the 100 largest metropolitan areas in America concentrated 74 percent of the country's college graduates, 75 percent of workers with graduate degrees, 82 percent of NIH and NSF research funding, and 96 percent of all venture capital funding.[10]

But beyond this arithmetic accumulation of inputs, regions are exponential in their impact. What ensures this is the geographic multiplier effect that results from the linking in dense places of innovation resources, human capital, infrastructure, and quality of place.

In this respect, a large body of evidence shows that dense populations and dense concentrations of business activity accelerate and maximize economic outcomes.[11] For example, such agglomerations ensure that while the 100 largest metropolitan areas in America contain 12 percent of the nation's land mass and two-thirds of its population and jobs they generate 75 percent of the nation's output, 78 percent of all patents, 85 percent of all new firms starts.[12]

To that extent, it is quite literally true that the U.S. economy is not only national but regional. Regions are not part of the national economy; they "are" the national economy, as Alan Berube has observed.[13] Policymaking needs to take that into account.

1. Current federal policy falls short

And yet, the fact is that federal (and to a lesser extent state) economic policy to date has not concerned itself much with this regional reality—for two reasons.

First, the federal government has not historically viewed regional competitiveness as an important foundation for national economic well-being and has instead concerned itself with what might be called the "macro" and the "micro." As Michael Porter notes:

> Economic policy, especially at the federal level, has traditionally focused on opposite poles. On one extreme, policymakers have sought to improve the general business environment that affects all firms. This occurs through policies such as macroeconomic stabilization, tax policies to

> encourage saving, investment and R&D, public investments in universities and physical infrastructure, and enforcement of antitrust regulations. On the other extreme, policies have sought to benefit the competitiveness of individual firms and individual workers. There are many such policies, including loan guarantees from the Small Business Administration and the Export Import Bank, technical assistance programs, training support for qualifying workers, procurement policies benefiting small businesses, and SBIR grants.[14]

Washington, in short, has for decades lacked what Karen Mills, Andrew Reamer, and Elizabeth Reynolds call a "middle" or "meso-" strategy—one that seeks to strengthen the institutions, networks, and regional economies that support business activity to address companies' needs collectively, not individually, through relevant joint actions.[15]

A second problem is related. Whether it is to promote innovation, foster entrepreneurship, provide business support, or engage in workforce development, federal and state economic programs typically aim at providing the "right" level of economic inputs but don't concern themselves very much with the real-world use and outcomes of such provision.

In this respect, too many federal and state programs assume too blithely that markets left to their own devices will then take full advantage of the inputs' availability.

Take federal and state government innovation policies, for example. Such initiatives, though often robust, are still largely based on what the economist Greg Tassey calls the "black box model" of growth, which assumes desirable goods and services magically appear as a result of the right combination of R&D spending with the traditional inputs of capital and labor (especially scientists).[16] However, this "magical" or "black box model" of innovation is misleading. Most notably, it suffers from assuming, as Tassey observes, that basic research gets easily or almost automatically translated into commercial activity. Yet commercialization *doesn't* happen easily. In fact, as Rob Atkinson and Howard Wial have written, the real-life commercialization process is jam-packed with complications and market problems, including information breakdowns, institutional inertia, coordination and communication problems, and poorly aligned incentives. [17] In this way, government economic policy has dwelt too much in the world of ideal conceptions and what Atkinson and David Audretsch call "mathematical models" and not enough in the messy and complicated world of how firms, industries, and national and regional economic systems actually work and perform.[18]

2. Clusters occupy the missing middle of conventional economics

Against this backdrop, clusters and the vast body of description, analysis, theorization, and measurement that have been carried out about them over the last 30 years have a compelling interest.

Clusters are groups of firms, related actors, and institutions that are located near one another and that draw productive advantage from their mutual proximity and connections.[19] Clusters arise and grow because the firms within them profit materially from the presence of powerful "externalities" and "spillovers" that bring them important competitive advantages, ranging from the presence of a specialized workforce to supplier specialization and the exchange of leading-edge knowledge.

Not much regarded by conventional economic discussions, clusters consist of the grittier, real-world interactions in real places of what Porter, calls "local things": firms, suppliers, trade associations and other coordinating organizations, specialized training programs, community colleges, university departments and tech-transfer offices, local governments.[20]

Clusters, in this respect, reside exactly in the "missing middle" of conventional economics, between the general economy and the individual firm. They grow in the often ignored space of places, local institutions, labor markets, and groups of firms rather than single firms. They are why the economic map has organized itself into scores of local agglomerations: biotech in Boston, information technology in Silicon Valley, and entertainment in Hollywood most famously, but also horse trailer manufacturing in north Texas, marine technologies in eastern North Carolina, and wine in southern Washington.

Large and Small Clusters Across the Nation

Famous examples include well-known industry concentrations such as IT in Silicon Valley, biotech in Boston, film in Hollywood, and oil and gas on the Gulf Coast, but a host of lesser-known and emerging-industry clusters are just as significant to growth and prosperity: **Colorado Cleantech:** More than 1,500 companies comprise Colorado's burgeoning clean-energy cluster, the fastest growing sector in the state and a magnet for venture capital. Institutions like the National Renewable Energy Laboratory (NREL) and the Colorado Clean Energy Collaboratory, a collaboration between NREL and the region's universities, nourish the cluster with groundbreaking research while giants like Vestas and Siemens add to the region's manufacturing capacity. Top-class universities like Colorado State, the University of Colorado at Boulder, and the Colorado School of Mines supply a skilled and highly specialized workforce. Ultimately this cluster owes much of its success to strategic state policymaking that established a market and fostered an environment in which it could and grow.

Indiana Life Sciences Cluster: Anchored by several large pharmaceutical, agricultural feedstock, and medical device companies, the region has also developed a concentration of 50 companies and over 8,000 skilled workers specialized in sophisticated biopharma services such as contract research, contract manufacturing, and logistics. Spurred by the efforts of the Biocrossroads cluster initiative, the state outpaced national life sciences job growth, at 17.2 percent versus 15.8 percent from 2001 to 2008, to employ a total of over 52,800 workers.

Michigan Battery Cluster: An existing core of 330 automotive R&D centers and over 65,000 engineers, complemented by targeted state incentives to promote related manufacturing and technology commercialization, positions the state to build up the regional battery value chain, from materials, cell, and pack manufacturing, to contract and original equipment manufacturing, and ultimately to powertrain integrators. Sixteen advanced battery companies are now located in Michigan, representing almost $6 billion in total investment and the potential to create 62,000 new jobs.

Northeast Ohio Polymers Cluster: Northeast Ohio's polymers cluster boasts a critical mass of polymer and advanced material manufacturers, specialized academic institutions, suppliers, and end users. PolymerOhio, a public-private-university technology center and one of many organizations supporting the cluster, serves as a networking and information hub. Kent State's Liquid Crystal Institute, the University of Akron's College of Polymer Science & Engineering, and Case Western's Center for Applied Polymer Research all contribute to the cluster's knowledge stock. The University of Akron's tech transfer program, for its part, ranks among the nation's best.

Puget Sound Interactive Media Cluster: Built off of the Seattle area's talent base in software, art and design, the region's video game industry cluster boasts over 15,000 well-paying, high-skilled jobs across 150 companies, generates $4.2 billion in annual output, and supports an additional 50,000 to 68,000 jobs throughout the Washington State economy. Region-wide, jobs at established employers grew by 14 percent (or over 5,000 workers) between 2006 and 2008 and 11 educational institutions offering curriculum around video game development continue to supply the sector with needed new talent.

South Carolina Auto Cluster: Since the first vehicle rolled off of BMW's Spartanburg, South Carolina assembly line in 1995 the state's 10 county auto cluster has grown smartly, comprised today of 125 automotive suppliers and related companies with an estimated annual economic impact of $8.3 billion. Clemson University's International Center for Automotive Research (CU-IACR), a public-private research collaborative, anchors the cluster with a graduate school in automotive engineering and research centers like the Information Technology Research Center, where mechanical, electrical, and computer engineers and students collaborate in an open-innovation, multidisciplinary environment to advance IT innovations in the auto industry.

Vermont Artisanal Cheese Industry: Growing from roughly a dozen members in the mid-1990's to nearly 50 today, the growth trajectory of the Vermont Cheese Council represent the great strides that the state's small but fast-growing and award-winning cheesmakers have made in this value-added niche market. Since 2003, the cluster has posted double-digit growth in production, and continued expansion is supported by industry-organized collaborative marketing and distribution efforts and the Institute for Artisan Cheese at the University of Vermont, the nation's first and only center for education, research, and technical services devoted to expanding and advancing the artisanal cheese industry.

Wichita Aviation Cluster: Wichita's aviation cluster is an export powerhouse of over 200 mostly small and medium firms, some over a century old, that collaborate to compete. Within the cluster, the National Institute for Aviation Research (NIAR) drives research collaborations between Wichita State University (WSU), NASA, the Federal Aviation Administration, and private companies like Lockheed Martin, Cessna, and Lear, that help the cluster's firms maintain their collective competitive advantage. To meet the cluster's coming workforce needs, the county, along with the NAIR, WSU, and the Wichita Area Technical College, came together to found the National Center for Aviation Training, which aims to be a national hub for aviation education, training, and research.

At the same time, clusters reflect the messy, synergistic dynamics of practical business activity inside the "black box" of innovation development.

Clusters, that is, entail not just individual actors and inputs but how groups of those actors and institutions organize themselves and interact within the given conditions to produce efficiency and value. In that fashion, the dynamics of clustering encompass a broad array of synergies, "knowledge spillovers," transactions, and relationships among firms, customers, and other actors that produce mutual benefit, generate firm and industry efficiency, and reflect the intense, constantly changing interconnectedness of real-world local economies.

Along these lines, economists have long recognized the presence of "agglomeration" forces that pull businesses and people into local places and enhance their productivity.[21] As long ago as 1890, Alfred Marshall was noticing that firms in a particular trade tended to locate near each other in the industrial districts of England, and suggested this was because they could derive mutual advantage from such dynamics as labor market pooling, supplier specialization, and knowledge spillovers.

More recently many others have described other ways that clusters provide efficiency to firms and markets. Porter stresses the importance of local clusters in easing the management of modern value chains, in which more firms contract out not just traditional parts production or support services but manufacturing, IT system management, training, design, and R&D.[22] Maryann Feldman notes that clusters foster innovation because they foster knowledge exchange among firms, colleagues, rivals, and knowledge institutions like universities in close proximity.[23] And for that matter others observe that strong clusters foster entrepreneurship by enhancing the range and diversity of firm creation, generating more ideas for start-up companies, and reducing the costs of starting a new business.[24]

The collaboration-enhanced dynamism bred by industry clusters is today helping to unlock the innovative and creative power in U.S. regions.

Colorado's cluster of roughly 1,500 cleantech companies relies heavily on the region's top-flight universities like the Colorado School of Mines—the only university in the nation to offer baccalaureate through doctoral degrees in all key energy fields—to supply a skilled and highly specialized workforce.

In Kansas, the Wichita area has built up over decades a comprehensive network of over 200 precision machine shops, tool and die firms, and other subcontract manufacturers within and outside of the aerospace industry designation that can quickly and cheaply provide every necessary part for airplane manufacturing.[25]

These suppliers keep manufacturing costs down by eliminating the need for each plant to buy highly specialized equipment or pay to ship parts from around the world.

And in central Indiana established pharmaceutical giants like Eli Lilly and Company support and benefit from active entrepreneurship to drive innovation in the region's life science cluster. Through the cluster initiative BioCrossroads, industry works collaboratively with government, philanthropy, and other partners to provide seed investments and business development assistance to entrepreneurs and form new enterprises to address specific cluster needs, including the sharing and management of clinical data and R&D.[26] To date, BioCrossroads has supported over 250 start-up companies and new non-profit enterprises to build on the region's existing base, which now includes over 8,000 skilled workers across 50 contract research and manufacturing companies that serve regional industry anchors as well as broader markets.

Speaking more generally, academic research has tended to associate the presence of clusters with enhanced and regional job and wage growth. For years studies have indicated a positive correlation between cluster concentrations and patenting.[27] Likewise, work going back two decades has increasingly suggested that clusters encourage new firm development, increase wages in an industry, and enhance regional economic productivity and broader performance.[28]

3. Select industry, local, state and federal actors already engage in cluster efforts

In keeping with all of this, meanwhile, a variety of organized efforts—regional cluster initiatives and even government-sponsored initiative programs—have grown up around the world and in the U.S. to promote cluster competitiveness through a variety of collaborative activities among cluster participants.

As a group, such cluster initiatives seek to compensate for the fact that the unattended marketplace will generate too few of such efforts given the presence of multiple market failures, given the partially shared, quasi-public goods nature of clusters, within which no individual actor can capture all of the benefits of participation given that ideas leak, workers are shared, and suppliers can sell to multiple buyers.

In that fashion, such initiatives may engage in industry strategy-setting, sponsor education and training activities, encourage relationship building, or facilitate market development through joint market assessment and marketing, among many other efforts.[29] Most notably, with little or no past federal support,

numerous U.S. regions and states today operate several hundred distinct cluster initiatives—formally organized efforts to facilitate cluster growth.[30] These initiatives—whether operated through state governments or regional development partnerships—have proliferated over the last 15 years in every sort of setting and sector: urban and rural, coastal and non-coastal, high-tech and manufacturing. Extremely varied, these "bottom-up" efforts to boost regional performance seek to address particular "binding constraints" on cluster growth through such activities as: convening cluster participants; making available relevant cluster information; encouraging networking within the cluster; facilitating market development; fostering innovation and its diffusion; sponsoring more relevant and contextual education and training activities; and representing cluster interests.[31]

In that sense, the nation's assortment of locally or state-developed cluster initiatives speaks directly to what goes on within the "black box" of innovation. Likewise, these initiatives represent an important effort to address the "missing middle" of economic management with practical initiatives to correct inefficiencies or shortcomings in the way local networks, institutions, and resources come together to support business activity.

A Comparison of Economic Development Models

Dimension	Traditional Economic Development	Cluster-based Economic Development
Economic Doctrine	Neoclassical economics	Innovation and Institutionalist economics
Key Actors	Individual firms	Groups of firms
Key Tools	Policies for the general business environment – tax and regulatory regimes, R&D investments, etc. Policies to benefit individual firms – loan guarantees, targeted procurement policies, etc.	Policies to support clusters, core institutions, network building, etc.
Key Process for Economic Growth	Markets allocating capital and labor inputs efficiently	Regional ecosystems engaging firms, financiers, universities, and other institutions in innovative activity
Role of Government	Provider of inputs and macroeconomic management	Provider of information; facilitator of collaborative, public-private partnerships

Source: Brookings Institution, Information Technology and Innovation Foundation, and Institute for Strategy and Competitiveness

And now the federal government and a new crop of pragmatic gubernatorial candidates have entered the arena.

Having remained largely absent from the realm of cluster initiative programs over two decades, for their part, the federal executive and most recently Congress have embraced "regional innovation clusters" (RICs) as a new framework for structuring the nation's economic development activities.

This embrace began tentatively and has grown. Initially, through its FY 2010 budget proposal, the Obama administration requested a modest $50 million for a cluster initiative program through which the Economic Development Administration (EDA) would launch a program to award small competitive grants to regional cluster initiatives along with a new cluster information and research center.[32] Congressional appropriators trimmed the program drastically but seemed to welcome the new direction.[33]

More recently, the administration has sought to expand its offerings by seeking to apply cluster approaches to multiple federal programs rather than anchoring them in a single discrete program. In August, for example, the Department of Energy (DOE) announced the winner of its Energy Regional Innovation Cluster (E-RIC) competition, which will provide up to $130 million from seven cooperating agencies to a Philadelphia-based consortium that will surround the start-up of a DOE energy innovation hub focused on building efficiency technologies with an array of resources aimed at connecting the research core to the surrounding regional economy.[34] The multiagency final format of the initially stand-alone hub represented an increased focus in the second year of the Obama administration on regional innovation systems.[35]

Along these lines, the current proposals for FY 2011—now being adjudicated in Congress—treat regional industry networks less as a "program" and more as an operating system for multiple activities and a means for linking and aligning multiple federal interventions to maximize their impact in support of regional prosperity.[36] As a group, they tend to support strategic, cluster-informed regional planning, align new funding flows and resources toward established industry clusters, and explicitly link various communities, such as workforce development practitioners and university researchers, to facilitate cluster-based job growth, entrepreneurship, and technology transfer.

In this fashion, at least five agencies are now engaged in a more pervasive embrace of cluster policy in the 2011 budget cycle:

- The EDA's proposed $75 million Regional Innovation Clusters program would provide regional planning and matching grants focused on leveraging regions' competitive strengths to boost job creation and economic growth.[37]

- The Small Business Administration (SBA) would support EDA's cluster effort by directing a proposed $11 million toward promoting greater small business participation in regional clusters by better coordinating its resources for business counseling, training, and mentor-protégé partnerships.[38]

- The Department of Labor (DOL) would use its newly proposed Workforce Innovation Fund (of up to an estimated $108 million) to help ensure that the workforce development system also aligns with regional cluster growth by facilitating regional collaboration among training and employment services providers and stronger linkages with employers so that worker training leads to good jobs.[39]

Recent Cluster-Supporting Federal Policy Efforts by the Obama Administration			
Lead Agency	**Program**	**Description**	**Status**
Economic Development Administration (EDA)	Regional Innovation Clusters framework	Represents a new cross-agency framework for federal economic development assistance to target and align funding to well-developed regional strategies that prioritize institutional collaboration and leverage core regional strengths.	The first implementation is the Energy Regional Innovation Cluster (E-RIC) program discussed below For more information, see www.eda.gov/AboutEDA/RIC/
EDA	I6 Challenge	Supports entrepreneurs and eliminate barriers to commercialization within regional innovation ecosystems through a $12 million competitive grant administered by the EDA in partnership with the National Institutes of Health and the National Science Foundation (NSF)	Award announcements to occur in Fall 2010 For more information, see www.eda.gov/i6
Small Business Administration (SBA)	Regional Innovation Clusters program	Provides up to $600,000 for business training, technology transfer, and mentoring services to self-identified regional clusters that have in place the partnerships, technical capacity, and other assets necessary for small business growth	Award announcements to occur in Fall 2010 For more information, see www.sba.gov/clusters/
SBA	Advanced Defense Technology program	Awards up to $600,000 to support and grow small businesses in regional innovation clusters focused on advanced robotics, cyber-security, applied lightweight materials, and other critical defense needs identified in conjunction with the Department of Defense	Award announcements to occur in Fall 2010 For more information, see www.sba.gov/clusters/
Department of Energy (DOE)	Energy Efficient Building Systems Regional Innovation Cluster (E-RIC)	Connects DOE, EDA, SBA, NSF, the Department of Commerce's Manufacturing Extension Partnership, the Department of Labor, and the Department of Education in joint funding opportunity of up to $130 million over five years to support a regional research center that develops and commercializes new building energy efficiency technologies and engages partners to promote broader regional energy cluster growth	Award announced in August 2010 to Philadelphia-based research consortium For more information, see http://www.energy.gov/hubs/eric.htm
U.S. Department of Agriculture (USDA)	Rural Innovation Initiative	Seeks to pilot strategic regional planning that connects rural communities to core local and metropolitan assets and opportunities through a $176 million fund that pools and coordinates a share of resources from existing USDA programs	Proposed in the Administration's FY2011 budget request For more information, see p.14 of the USDA budget summary: http://www.obpa.usda.gov/budsum/FY11budsum.pdf
NSF	NSF Innovation Ecosystems	Aims to support regional clusters around universities with $12 million directed at increasing the impact of promising innovations through commercialization, industry alliances, and start-up formation	Proposed in the Administration's FY2011 budget request For more information, see p.4 of the NSF budget summary: http://www.nsf.gov/about/budget/fy2011/pdf/01-Overview_fy2011.pdf

- The Department of Agriculture's (USDA) budget request calls for a Regional Innovation Initiative to align federal resources to promote more economic opportunities in rural communities and have greater regional impact. To support this approach, USDA plans to set-aside roughly 5 percent of the funding from approximately 20 existing programs and allocate these funds competitively among regional pilot projects tailored to local needs and opportunities. While not specifically focused on industry

clusters, the $1.4 million proposed for regional planning activities and $135 million expected for project implementation from new USDA set-asides does seem to provide yet another avenue for regional cluster support and development (while also dispensing with the myth that clusters are only "urban").[40]

- The National Science Foundation (NSF) plans to invest $12 million to promote new "NSF Innovation Ecosystems" as a part of its existing $19.2 million Partnerships for Innovation program. The new "innovation ecosystem" component aims to support regional innovation clusters around universities by engaging faculty and students across all disciplines in efforts to increase the impact of promising innovations through commercialization, industry alliances, and start-up formation.[41]

Congressional action on these budget proposals is ongoing. Also worth noting is the inclusion of a regional innovation clusters section in the America COMPETES Reauthorization Act of 2010, which passed the House in June and the Senate Commerce, Science and Transportation Committee in July.[42]

At the same time, governors and gubernatorial candidates of both parties are maintaining or stepping up their interest in cluster-led strategies and investments across administrations. For example, both Arizona's Science Foundation Arizona and Ohio's Third Frontier were initiated by governors of one party (Democratic in the former; Republican in the latter) as vehicles for cluster-based, innovation-oriented economic development and continued to successfully operate and even expand under subsequent governorships by the other party.[43]

Meanwhile, the bi-partisan consensus is being extended by leading candidates in the 2010 election. In Colorado, Michigan, New York and Tennessee, for example, John Hickenlooper, Rick Snyder, Andrew Cuomo and Bill Haslam all suggest tailoring state economic and workforce development strategies to the distinct business clusters of different regions. Hickenlooper and Cuomo are Democrats; Snyder and Haslam are Republicans. Haslam, the current Mayor of Knoxville, has even called for "regional jobs base camps" to coordinate disparate investments in the service of unified strategies.

In sum, the year 2010 represents an important juncture for U.S. economic development. On display are a series of new initiatives that assume that the American economy is regional; that regional industry networks and clusters are a defining aspect of its organization; and that clusters of firms and other actors and their interactions are a proper object of national economic policy.

III. REGIONAL INNOVATION CLUSTERS: WHY NOW?

All of which begs the question: Why now? What makes regional innovation clusters so relevant to national policy debates just now—years after many development professionals had already succumbed to "cluster fatigue."

Clusters, after all, aren't the latest or most avant-garde economic development concept. Nor do they offer the blunt, self-evident drama or controversy of the extraordinary actions the Obama administration took to stabilize the nation's financial markets and restart lending in the winter of 2009 or to directly stimulate the economy with the Recovery Act of 2009 and the "bailouts" of the auto companies.

And yet, the fact is that clusters have emerged now as a major paradigm for national, state, and metropolitan economic steerage for three principle reasons:

- First, new research has provided added evidence that clusters on the ground promise solid *economic benefits* at a time of economic uncertainty

- Second, at the paradigmatic level, clusters *reflect the nature of the real economy,* which means that thinking about them and leveraging them can help the nation get clearer about the true sources of growth after years of diversion

- And third, clusters and cluster thinking offer *a compelling framework within which to rethink, reorganize, and reform* federal, state, and regional economic development efforts

For each of these reasons clusters and cluster approaches hold out substantial attractions as the nation seeks to rebuild a damaged economy:

1. Impact: New research holds out the possibility of improved economic performance

The first reason for clusters' new relevance is that of straight economic benefit. New research in the last few years has firmed up the literature on the value of clusters to workers, firms, and regions. It is now broadly affirmed that strong clusters foster innovation and entrepreneurship and deliver positive benefits to industries, workers, and regions. In light of this, significant new empirical research suggests the potential of vibrant local clusters to help deliver high-quality, productive growth in the medium term in several ways:

- **Innovation.** Recent work on innovation, for example, has reiterated that firms and inventors located in clusters are significantly more inventive. Baptista and Swann determined recently that manufacturing firms in the UK were significantly more likely to innovate if own-sector employment in their home region is strong.[44] Sonn and Storper have determined that U.S. inventors increasingly use domestic knowledge more than foreign knowledge and knowledge from the same metropolitan area than knowledge from outside.[45] And Aharanson, Baum, and Feldman recently found that firms in the Canadian biotechnology industry are as much as eight times more innovative when located in clusters with strong specializations in their own technology.[46] In this connection, Aharanson, Baum, and Feldman observe that clusters in particular fields can produce highly efficient "learning environments" in which firms score innovative gains even from the R&D efforts of other firms. They conclude that evidence is mounting that knowledge flows and spillovers associated with industrial clustering are critical to innovation and the geographic distribution of economic value creation.

- **Entrepreneurship.** New work has also moved beyond innovation to the role of regional clusters in new firm formation, growth, and survival. Looking at metropolitan New York, for example, Rosenthal and Strange have shown that new firm starts and employment increase with the density of local employment in an entrepreneur's industry.[47] They show these effects are significant and drop off quickly with distance. Likewise, Wennberg and Lindqvist studied all "new economy" firms started in Sweden between 1993 and 2002 and found that location within a cluster had strong positive effects on the survival of new firms.[48] Cluster-embedded start-ups also generated more jobs, higher tax payments, and higher wages. Finally, Delgado, Porter, and Stern recently analyzed data from the Census Bureau's Longitudinal Business Database and located significant evidence of the positive impact of clusters on entrepreneurship. They find that industries located in regions with strong clusters experience higher growth in new business formation and start-up employment. They further report that strong clusters are also associated with the formation of new establishments of existing firms and start-up survival.

- **Firms and industries.** More broadly, clusters are being confirmed to foster productivity and growth. Across 218 metropolitan areas, Henderson found that the presence of other firms in the same industry and the same county dramatically increases firm productivity.[49] Nakamura finds that clustering is positively and significantly associated with higher productivity in Japan and the U.K. for manufacturing, retail, and wholesale industries

as well as finance.[50] And in a comprehensive analysis of the Canadian economy Spencer and others have determined that the geographical clusters in economic activities leads to superior industrial performance. Most notably, this inquiry concludes that when industries locate in an urban region with a critical mass of related industries they tend to generate both higher incomes and rates of employment growth.[51]

- **Regions.** Finally, recent evidence continues to suggest that the strength of local clusters strongly influences the performance of regional economies. Delgado, Porter, and Stern find that the relative strength of a U.S. region's leading clusters contributes to the employment and patent growth of other clusters in the region.[52] Similarly, Spencer and others conclude that city-regions with a higher percentage of employment in clusters have enjoyed better economic performance (as reflected in income levels and employment growth) than places in which cluster-based employment is less prevalent.[53]

One reason for clusters' increased saliency, then, is the fact that industry clusters are increasingly being seen to have a quantifiable and beneficial impact on economic performance at the firm, industry, and regional level. That no consensus exists in the economic literature about the wisdom or proper design of specific cluster policies cannot, therefore, alter either the fact of clusters' increasingly recognized importance or the renewed interest of policymakers. That clusters represent place-bound, highly embedded and interconnected centers of leading-edge industrial activity that may be less susceptible to offshoring only adds to their attraction.[54]

Further increasing the new interest in clusters as a source of improved economic performance, finally, is the spreading embrace of cluster policy and cluster initiatives by dozens of competitor nations around the world. Fully 26 of the 27 member countries of the European Union (EU) have cluster policies in place as do Norway, Switzerland, Turkey, Iceland, and Israel—five non-EU countries also tracked by the European Cluster Observatory (ECO), an organization that maintains data on and maps all of Europe's 2,000 identified clusters. By January 2008, a total of 69 national cluster programs had been identified by the ECO.[55] Japan, for its part, supported 102 industry clusters in FY 2009 with a ¥30 billion (over $300 million at 2009 exchange rates) budget through its Industrial Cluster Project and Knowledge Cluster Initiative, both first launched in 2001, which support government-university-industry linkages.[56]

2. Paradigm: Clusters reflect the nature of the real economy

But there are other reasons for clusters' special relevance now. At the level of paradigm, for example, clusters represent a timely and useful conceptual lens, because at a moment of uncertainty about the sources and dynamics of future growth these local industry concentrations represent a powerful, grounded way to understand the nature and workings of the real economy. Clusters, in short, help clarify what matters in economic affairs (after a period of delusion and over-simplification) and point in several useful directions:

- **Regional underpinnings.** To begin with, the cluster framework reveals and emphasizes the regional nature of the economy. Until recently, very little national or state economic thinking recognized the centrality to the nation's economic outcomes of its regional economies.[57] Instead, attention has been focused on either the macro-performance of the nation or on the fortunes of individual industries or firms. However, because physical proximity and locally bounded exchanges matter so much to their workings, clusters highlight the importance of geography, space, and regions in the structure of the national economy. Clusters, in that sense, make unavoidable the fact that locations matter. And the truth that flows from that recognition is critical: As Michael Porter writes, "There is no national economy…but a series of regional economies that trade with each other and the rest of the world."[58]

- **Local specialization and variation.** A related virtue of the cluster paradigm is that it moves to the forefront the variation, diversity, and myriad local specializations of the productive economy. In this connection, a focus on clusters highlights not just that regions matter, but that every region consists of a unique local economy with its own array of traded clusters, regional advantages, and starting points. This too is a welcome aspect of a cluster focus. For too long, too much national and state policy discussion has assumed a development landscape across the nation that is largely homogeneous.[59] All that really mattered, in this view, was getting the general business environment right, keeping taxes at the right (low) level, and providing some basic inputs such as R&D, access to capital, education, or infrastructure. Yet America's production economy is not so simple or homogeneous (even if sameness rules the consumption map!). Instead, whereas a home is a home and a Wal-Mart a Wal-Mart on the consumption side, Wichita's aviation-focused production economy in the Midwest varies sharply from Michigan's, with its emerging focus on batteries and electricity storage, and Colorado's, with its heavy orientation toward military and space applications. What's more,

Denver's green economy looks very different from St. Louis' and Sacramento's and for that matter Philadelphia's. And for good reason: Different regions have different starting points, different past choices, different natural and institutional advantages, different human capital inheritances, different specializations, different development opportunities and needs. To see the reality of those differences playing out witness the highly uneven extent of the recent economic recession and recovery as logged by the most recent edition of the Brookings Institution's *MetroMonitor* index of metropolitan economic performance.[60] In short, the present focus on clusters makes clear not just that the national economy is a series of regional economies busily engaged in trade, but that each regional economy has a particular array of specializations that drive both local productivity and growth in the national economy.[61]

- **Regional institutional exchanges and dynamics.** Finally, clusters represent a valuable paradigm for thinking about the economy just now because they direct attention to the true richness of regional economies' myriad actors and their exchanges—a crucial source of local and national efficiency, productivity, and growth. Standard economic doctrine (even after the recent financial system crash) tends to neglect such considerations, and to conceive of the economy as a vast equilibrium of individual, profit-maximizing firms acting in narrow self-interest. As a result, very little attention has been paid to the specific mechanics of how innovation and jobs can arise from the intense, place-based interactions of firms, suppliers, workers, universities, trade associations, investors, governments.[62] By contrast, cluster discussions simultaneously widen and narrow the focus. Cluster discussions widen the focus because they direct attention away from isolated individual firms and toward groups of firms, networks of actors, and interactions among companies and institutions, whether intentional as in their supply chain relationships or unintentional through random knowledge spillovers or workforce sharing. This emphasis makes it easier to see that large firms and tiny start-ups, large research universities and local community colleges, multinational corporations and tiny start-ups are all part of the same intricate local web of firms, suppliers, and institutions that needs to be cared for comprehensively. At the same time, cluster inquiries narrow and refine the focus. This is because such discourse dwells on the microeconomics of particular, specialized local industry groupings. For that reason, cluster discussions may begin with broad discussions of the general business environment (e.g., interest rates, tax rates, labor

rules) but they tend to dwell on finer-grained, cluster-specific factors (e.g. the presence of particular types of suppliers, particular types of workers, particular university research programs).[63] This simultaneous widening and narrowing of the discussion will surely be useful for sharpening future debates on how best to go about rebuilding the American economy.

In short, regionalism and cluster thinking provide a useful framework for rethinking key tenets of a sometimes obtuse recent economic consensus.

3. Policy: Clusters provide a framework for rethinking and refocusing economic policy.

Finally, clusters provide a timely framework for rethinking and refocusing economic policy after a period of drift. In this way, the cluster paradigm yields practical insights that can help policymakers at the federal, state, or level rethink their priorities right and maximize the impacts of their efforts at a time of constrained resources. Along these lines, cluster thinking appeals because it:

- **Puts the policy focus on regions.** To be sure, attention to the general business environment and national macroeconomic steerage will always be critical. But the cluster framework has the useful benefit of directing policymakers' attention to regions and to the regional locus of growth and productivity, which has too long been neglected.

- **Draws attention to the "missing middle" and what's inside the "black box."** In like fashion, where recent economic policy has tended to neglect the "meso" level and the inner workings of the "black box" of innovation, the cluster paradigm renders a service because it focuses policymakers on the grainier real-world dynamics of regional economies—labor market pooling, supply-chain interactions, knowledge spillovers, how institutions, firms, and other actors interact. These dynamics provide crucial leverage points for those seeking to maximize economic performance and represent a timely new focus for policy after years of disdain for the messier practical processes by which value and advantage are created.

- **Highlights variation and the need to allow local discretion.** Cluster frameworks also counter the one-size-fits-all outlook of so much recent development policy. Because the local dynamics of every cluster are unique, the cluster paradigm requires policymakers to take into account and nurture local differences. In this respect, since clusters vary from industry to industry and region to region neither national nor state

development strategies nor cluster strategies can work top-down, through a single template. Instead, each region and each cluster must craft its own competitive strategy, recognizing that clusters and regions can develop only by exploiting their distinct economic advantages and seizing their unique opportunities in rapidly shifting markets.[64] Given that, the cluster paradigm reminds leaders that the federal government and the states can help regions execute smart cluster-oriented initiatives but as Mark Drabenstott says, "the real answers…lie in the regions themselves." This too has important and timely ramifications for policy.

- **Provides a vehicle for policy coordination and efficiency.** Clusters, finally, throw into relief the need to coordinate fragmented policy offerings and maximize the impact of federal and state investments at a moment of budgetary crisis. Currently, thousands of separate federal and state programs exist to carry out export promotion, clean energy deployment, innovation strategies, workforce training, entrepreneurship support, capital access, infrastructure investment, technical assistance, and regional planning and information strategies. However, after decades of proliferation, the resulting accumulation of programs has become what Mills, Reynolds, and Reamer call "wildly ad hoc, idiosyncratic, and uncoordinated."[65] The result: Substantial investments in innovation, infrastructure, human capital, or placemaking too rarely have the kind of market-shaping effect that policymakers and taxpayers want and expect. And so a focus on clusters has the welcome potential to bring order out of the programmatic chaos. Clusters generate powerful synergies in local economies by organizing, matching, and linking the key actors and assets, and they can do that with government programs too. Therefore, the implementation of existing and new federal and state programs should be carried out to the greatest extent possible in ways that maximize the ease with which retrofitted or new programs can be accessed by local cluster initiatives, coordinated with other offerings, and aligned with the needs of the cluster. Along those lines, by giving priority in grants or other benefits to applicants engaged in cluster development and seeking to ease the coordination of programs at the local level governments will gain a powerful mechanism for drawing disparate programs and policies together into an overall strategy for improved competitiveness and maximum return.

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In short, while cluster strategies are not new and remain subject to debate, as the Organization for Economic Cooperation and Development (OECD) puts it, a

moment of renewed interest in U.S. policy circles coincides with a time of national and regional need, questioning, and experiment.[66]

Anxiety about the sources of future growth has drawn attention to new empirical evidence that industry concentrations lead to increased innovation, greater entrepreneurship, and improved regional economic performance. Calls by business leaders and many economists for a new growth model in the wake of the recession have highlighted the distinctiveness and centrality of metropolitan economies. And finally, federal, state, regional, and private-sector policymakers everywhere are intrigued by the potential of cluster strategies to deliver not only improved economic results but also greater policy impact. Such leaders are looking for strategies that can "help maintain employment and promote restructuring and adaptation" across multiple sectors, as the OECD says, but they also suspect clusters offer a convenient, grounded, and low-cost organizing mechanism by which to focus resources, build partnerships, and maximize efficiency and impact.

Such a convergence makes it clear "cluster fatigue" has been replaced or complemented by something of a "cluster moment"—a juncture in which real promise exists for a new recognition of the centrality of regions, the importance of clusters, and the need to swing siloed federal, state, and local programs behind those realities.

IV. REGIONAL INNOVATION CLUSTERS: WHAT'S NEXT?

So a new moment has arrived for regional industry concentrations. Yet if that's true, it has only begun to take shape. And so the next several years offer an important opportunity to make regional innovation clusters and spatial thinking a core element of economic policy and action through astute analysis and implementation across all levels of U.S. government and in partnership with the private sector.

What will it take to ensure this moment is leveraged to maximum effect? Certainly it will require smart, collaborative policy innovation at all levels of government—federal, state, and local—and in the private sector. Given that the cluster paradigm speaks to the way all manner of actors and inputs come together in regions, all tiers of government, all kinds of organizations, and all sectors of the economy will have roles to play in any further embrace of cluster strategies in the U.S.

To succeed, however, such a furthered embrace of the cluster approach will ideally feature a mutually supportive pull or push in similar directions among myriad actors.

In keeping with that, it seems worthwhile to review a few general principles for productive pro-cluster activity going forward before examining some opportunities for leveraging the power of clusters at the various levels of government.

1. Policymakers at all levels should abide by some general principles

As cluster-led strategies and policies grow in number and importance, there are several guiding principles that should be taken into account. These range from the cautionary to the methodological to the practical and include such core admonishments as these:

- **Don't try to create clusters.** Cluster initiatives, to begin with, should only be attempted where clusters already exist. Clusters cannot be created out of nothing.[67] In fact, there exists virtually no evidence that government policies are capable of successfully creating clusters in particular locations where none previously existed.[68] Instead, it is quite clear that efforts at wholesale invention will be fraught with inefficiency, selection issues, and likely failure and waste. On the other hand, the preexistence of a cluster means that an industry hot spot has passed the market test. It is a sign that the requisite conditions and capacities are present to support industry growth. To that extent, the best policy

advice for fostering clusters is probably that of Joe Cortright: Communities and governments should "focus on establishing the right conditions for new industry clusters to emerge [in]," and then recognize and nurture "those clusters that establish themselves."[69]

- **Use data and analysis to target interventions, drive design, and track performance.** Cluster strategies or policy interventions—when attempted—should be grounded in empirical information and analysis so that decisionmakers can make objective assessments about the competitive prospects of different regional industry concentrations. Unfortunately, of course, American economic development tends to be highly influenced by an ever-changing mix of interest group agendas and economic development fads, whether it be the life sciences, stadiums, the "creative" class, or "green jobs." Yet to be successful, cluster development needs to focus its work on truly viable, distinctive, and competitive specializations. And that requires a strong empirical platform. Crucial to that platform, meanwhile, are empirics of three sorts. First, *objective market analysis* is necessary to document the natural presence of clusters, their global market positioning, and the possible relevance of cluster-oriented development initiatives. Second, *fine-grained information about local clusters' institutional or resource deficiencies* is essential to target and bound proposed interventions. And third, cluster strategies need to be held accountable, so *performance measurement* is critical. On this front, key indicators of cluster performance (jobs created, firms established or grown, investment attracted, market share increased) needs to be collected and analyzed over time so the efficacy of investments and efforts can be objectively assessed.

- **Focus cluster initiatives on clusters where there is objectively measured evidence of under-capacity.** At a time of short resources and potential parasitism, cluster initiatives must be tightly focused. Given that, work to upgrade a cluster once a cluster has been identified should be tightly focused on attacking specific, documented constraints, institutional deficiencies, or resource shortcomings. In this fashion, public expenditures on cluster initiatives should be contingent on painstaking, transparent quantitative analysis of the cluster's specific needs.[70] Such needs may entail shortcomings in the level or quality of R&D; problems with the practical skills of the local workforce; or particular institutional problems or flaws in local government policy implementation. In any event, cluster strategies and initiatives should

only be attempted where they can be tuned to fine-grained problem-solving in a cluster.

- **Maximize impact by leveraging cluster-relevant preexisting approaches, programs and initiatives.** "Clusters" and cluster strategies—correctly viewed—ought to be less a matter of programs and policy products than a paradigm through which to inform, draw in, and organize multiple activities. Specific, targeted cluster-oriented programs and initiatives are clearly justifiable, but the equal value and added impact may well come from drawing other, more generally relevant programs into the cluster orbit. For that reason, a new round of experimentation with cluster initiatives, strategies, and programs should seek as much to leverage existing programs and activities as invent new ones. To that extent, efforts to improve the general business environment in and around the cluster may well represent a lead aspect of a serious cluster push. Likewise, ongoing initiatives to improve tech-transfer in a region may loom large to a particular cluster. And on it goes. At the federal level, programs like the R&D tax credit as well as SBIR and SBTT grants, patent and intellectual property law, and multiple workforce training, small business finance, and regional development programs may all rightly be viewed as "cluster" programs in particular cases. At the state level, banking regulations and tax credits for venture capital are relevant to potential financing gaps, while education policy, land use regulations, and infrastructure issues all touch on issues relevant to clusters. And at the regional and local level, zoning policies or transportation initiatives may be relevant "cluster" issues since they may affect the access of workers to industry concentrations. In this sense, much of the new round of cluster strategy should entail not specific new "cluster" programs and initiatives but robust efforts (informed by cluster analysis) to ensure a supply of high-quality cluster inputs and build up basic public and quasi-public goods that have a significant impact on many linked businesses.[71]

- **Align efforts "vertically" as well as horizontally.** One of the attractions of cluster strategies is that they offer a plausible, grounded basis for organizing the disconnected policy offerings of any one level of government in service of clusters' needs in each region. Such "horizontal" coordination must be counted one of the most important strengths of cluster policy. Going forward, though, another need will come to the fore: that of "vertical" program alignment. That is, with federal, state, and local governments and development organizations

all now in the cluster business, such vertical coordination of economic development offerings up and down the tiers of federalism will become increasingly important to avoid policy conflict, redundancy, or missed opportunities for synergy. Most notably, the coming start-up of new federal efforts will need—if it is to have maximum effect—to leverage the myriad efforts that states and regions already have in place. In this respect, utilizing cluster strategies to deliver on the promise of synergy and efficiency is going to require thought about how federal, state, and local development efforts can be coordinated to serve a single end: regional cluster growth. Ideally, national, state, and regional adoption of cluster paradigms and strategies will be mutually supportive and aimed in the same direction.

- **Let the private sector lead.** Finally, care should be taken to keep private industry in the lead on cluster strategy. Clustering is a dynamic of the private economy in the presence of public goods, and so cluster strategy should be pursued with humility as a matter of supporting, connecting, filling gaps, and removing obstacles. Along these lines, as Michael Porter writes, "active government participation in a privately led effort, rather than an initiative controlled by the government, will have a better chance of success." [72] Companies, as Porter writes, "can usually better identify the obstacles and constraints (as well as the opportunities) in their paths." Companies often possess the latest information on market trends, innovation opportunities, and the latest developments. Cluster strategy should be pursued as a collaborative undertaking led by industry and defined by market signals.

With these general principles in mind, then, all levels of government have enormous opportunities for policy innovation before them—opportunities made urgent by the nation's current near- and long-term economic challenges.

In this respect, while it is clear that the private sector in places such as Albuquerque, Wichita, and Cleveland will lead the nation's economic renewal, smart, targeted government action to support innovation clusters there and elsewhere will also be critical to improve the general business environment, address gaps in local innovation systems, and knit together supports for clusters.

To that end, all tiers of the nation's federalist system have roles to play in advancing the co-development of such a new cluster- and region-aware stance in U.S. economic policy. In keeping with that, a rough division of labor among the tiers of government can be envisioned:

2. Federal policymakers can provide a base of useful resources for cluster practitioners nationwide.

It goes without saying that a top priority for federal action must be to properly design and crisply roll out its newly authorized and appropriated cluster programs. Top-flight implementation must always be a watchword.

But beyond that, the federal government should move in the coming years to:

- build the information base on clusters
- ensure that effective forums for best practice sharing and coordination are created
- build the capacity of regional cluster intermediaries
- employ cluster paradigms in work on major national challenges
- develop a forum for coordinating disparate cluster-relevant programs
- make it all visible

Such steps are the way to a successfully integrate the cluster paradigm into U.S. economic management for the long haul.

To start with, the federal government should place a heavy emphasis on assembling and disseminating a **rich information base** on the location, market characteristics, and dynamics of the nation's industry clusters, as recommended in the Brookings paper "Clusters and Competiveness."[73]

Objective, detailed data and other information—including on best practices and policy innovations—will be essential if American regions and intermediaries are to successfully design and employ cluster strategies, or if governments are to target existing programs on promising clusters. Yet only the federal government and its national partners have the reach and authority to create uniform, fine-grained datasets that can inform state and metropolitan decisionmaking. And so the federal government—perhaps through partnerships with top outside experts—should seek to fund and execute a state-of-the-art cluster data and analysis enterprise.

One such effort will soon be underway with the selection of an expert team to execute a $1.5 million innovation cluster "mapping" project for the EDA.[74]

But much more work is needed. Such mapping, to begin with, needs to be utilized soon to build a registry of designated clusters and cluster characteristics that could then be used to guide investment decisions, both of the government and private sector. Beyond that, as Andrew Reamer has argued, it is critical that the nation rebuild and enhance the degraded federal statistical system more generally so as to allow timelier, finer-grain analysis of regional economic dynamics.[75] In any event, the benefit of federal information efforts is clear. Such efforts will at once enhance the quality of local cluster initiatives and proposals and improve government decisionmaking about clusters, regional economies, and proposed interventions. At a minimum such information will compel federal and local leaders to compare and contrast their clusters of strength objectively with those in other communities and even countries, and focus their efforts on clusters in which they see objective advantage.

Besides information, though, information dissemination is crucial. For that reason a second priority at the federal level should be to **ensure robust learning forums exist** for the exchange of cluster best practices and innovative new strategies. Cluster strategies have largely arisen as ground-up phenomenon, with little direction or cataloging by the federal government. This is quintessential American entrepreneurialism. But the field has evolved to the point where, at a minimum, best practices and innovative new ones—in policy, investments, monitoring and measurement, and governance—can be distilled and shared for the enhancement of practice. To this end the government—without itself running such a forum—should see what can be done to ensure there exists a robust, widely accessible learning forum or network for assessing, diffusing, and promoting the best and most innovative cluster strategies. Such a network—operated perhaps by external non-profit, academic, or think-tank partners—could be anchored by a core forum that would hold convenings on a regular basis to discuss innovations in cluster policy and practice. Such forums can be vital to help fields grow and evolve and for the peer-to-peer transfer of learnings and knowledge. The forum could also be an occasion to unveil an annual award for the most innovative, collaborative, or successful regional cluster strategy, somewhat in the manner of the EDA's new i6 Challenge competition or more broadly like the Malcolm Baldrige National Quality Award.[76] Prizes are a proven way to accelerate innovation across firms, institutions, and places.[77]

Relatedly, the federal government should continue its push to **build the capacity** of the critical intermediating organizations that tend to design and deliver the nation's cluster initiatives and strategies. Technical assistance and planning grants will be critical.

A fourth priority is more substantial: The federal government should **employ cluster strategies to achieve key national goals.** In this fashion, a national

government cognizant of cluster dynamics throughout its economic dealings should most certainly consider the relevant cluster structures relevant to advancing its top-priority efforts to renew the economy.

The Obama administration, for example, has set a goal of the nation doubling its exports over the next five years. Such an achievement could be central to a broader economic recovery, which is why the administration has developed a National Export Initiative (NEI) to deliver on that goal. And so cluster strategies should become a key tool for executing NEI. Regional clusters, for example, could become a key analytic and targeting element of the Department of Commerce's promising Global Emerging Market Strategy ("GEMS"), which seeks to connect American firms to second-tier cities and metros in fast growing nations like China, India and Brazil. Likewise, Department of Commerce (DOC) also has expressed significant interest in helping cities and metropolitan areas design and implement export initiatives that are tailored to the specific attributes of different communities. Similar cluster-focused strategies should be applied in the clean energy and innovation arenas, whether to foster the growth of clean tech clusters in the auto-impacted Great Lakes and Mountain West regions; assist with disaster recovery along the Gulf Coast; or repurpose regional military and defense installations, like Florida's Space Coast which will need to transition to new economic avenues once NASA's Shuttle Program winds down.

A fourth related strategy for the federal government must be to create forums and **mechanisms for coordinating** its own policy offerings and those of others, both horizontally and vertically. Work on coordinating the various cluster activities of federal agencies will soon begin with the launch of a multi-agency Taskforce for Advancing Regional Innovation Clusters (TARIC). TARIC will function most immediately as something of a multi-agency SWAT team tasked with bringing a cluster view to bear on large national or regional problems or opportunities. For example, TARIC will be a central point for attack for marshalling existing efforts in support of regional clusters, whether they reside at the EDA, the International Trade Administration, the National Institute of Standards and Technology (NIST), the SBA, the DOL, or the Department of Education. But TARIC will also provide a needed forum for drawing together disparate program offerings, breaking down silos, and supporting integrated implementation. In this way TARIC may help with the work of horizontal program integration.

More tricky will be the task of making sure federal efforts link well with related state and local efforts, given that states and regions themselves have already invested significantly to support their own industry clusters.

Mechanisms need to be developed to ensure that federal programs ideally support, rather than disrupt or duplicate state or local initiatives. Perhaps the

federal government should host an annual Federalist Forum in concert with constituency organizations like the National Governors Association, the State Science and Technology Institute, or the International Economic Development Council to discuss smart ways for locating synergies in cluster policy and practice.

Finally, the Obama administration should make it all formal—and prominent. Recognizing the moment and the significance of the paradigm shift now underway, the White House should consider issuing an **executive order or comparable policy statement** to pull together the administration's theory of the case and articulate the disparate policy and programmatic elements that comprise federal cluster policy. In this respect, the policy statement could reflect and relate to other critical policy statements in the exports and innovation fields. This would be a strong affirmation of the notion that the time for "meso" and regional economic policy has arrived.

3. State policymakers should strategically invest their own resources in cluster-led economic development.

But a true pivot to more regionalist, cluster-oriented economic management will not happen solely or even mostly by dint of federal initiative. State government, regions themselves, and of course the private sector all matter equally or more.

States, especially, are in many respects the lead federalist actors on cluster-led economic development.

The states have important resources of their own to invest strategically and ample powers to shape their own economic destinies. They conduct their own trade missions to drum business for key exporting firms as well as attract foreign direct investment. And they have been directing funds to research centers, education and training programs, incubators, and industrial parks aimed at fortifying their strongest sectors "since before the term 'cluster' entered the policy vernacular," as Stuart Rosenfeld has written.[78]

Thus, while the federal government can set a national platform for identifying clusters and implementing cluster led economic policies, the states are likely to continue to be the vanguard of policy innovation in this area.

Most notably, they can:

- Make clusters a central component of economic development planning

- Target strategic investments on clusters of state significance

- Adjust metropolitan governance to ease regional collaboration

First, states can **make clusters a central component** of state economic planning, building on the campaign promises of many leading candidates for governor.

To be sure, many states have already assumed a leadership role in funding innovation and cluster strategies in the absence of past federal clusters support.[79]

But now there lies ahead an opportunity to build dramatically upon existing cluster efforts and advance the current regionalist drift by implementing the current round of campaign promises in the early part of the coming new administrations.

And so the next class of new governors has a chance to bring the full power of state government behind efforts to derive state advantage from policies that increase the power of metropolitan area clusters to accelerate economic growth. In that vein, governors and their transitions this fall should make cluster paradigms and mapping central to their administrations' economic development activities, make sure an adequate fact base exists for policymaking, and direct representatives from multiple state agencies to work closely with business leaders, universities, and local and metropolitan government officials on cluster strategies that meet rigorous criteria.

Some of these initiatives could also have a spatially targeted component, particularly with regard to clusters that naturally congregate around institutions of advanced learning or logistical hubs like ports and airports. In this regard, the Ohio Department of Development's Hubs of Innovation and Opportunity initiative, launched in January 2010, could serve as a model for many states for the way it competitively designates "hubs," like Toledo's Solar Energy Innovation Hub and Cleveland's Health and Technology Corridor Hub, for state grants and technical assistance to build on regional anchor institutions and core industry strengths to grow clusters of connected businesses, encourage new private investments, and attract a talented workforce.[80]

Given the current moment of economic distress, it might make sense for incoming governors to organize jobs cabinets, oriented to boosting regional performance through cluster strategies, with clear lines of authority and responsibility so that these cross-agency actions can be carried out in a collaborative manner.

A second state-level initiative would be for states to target strategic **investments on clusters of state significance**. Such investment targeting has already been the methodology of Pennsylvania's Industry Partnership program and Georgia's WorkReady Regions effort, and it is the practice followed in Germany, where the state government of Bavaria has for more than a decade made strategic investments to facilitate sustained, long-term success in key regional industries. There, the state helped to found the Munich-area biotech initiative, BioM, which establishes networks between industry, research, start-ups, and the financial world; provides seed capital for new ventures; and supports new incubators to accelerate new bio-business formation. Further, the Bavarian State Government's High-Tech-Initiative launched a "software offensive" focused on research, development, and training to enhance the region's information and communications technology cluster.[81]

The current fiscal situation, of course, will likely complicate new investment. The incoming crop of governors will face daunting fiscal challenges, requiring them to grow and reorient their economies while practicing austerity in government. Yet states often couple cuts in state spending with separate appeals to voters to invest in high priority initiatives. Earlier this year, for example, Ohio's Governor Ted Strickland successfully balanced the budget while, at the same time, helping to push through a $700 million bond issue that extended the Third Frontier program, the state's principal vehicle for investments in technological innovation.[82] A similar use of ballot referenda could be used in other states to invest in particular promising clusters. And it goes without saying that such investments should be guided by fine-grained close analysis of the specific asset gaps or binding constraints impeding cluster growth.

Third, states can compel **changes in metropolitan governance** in the service of cluster strategies. In the end, all cities and municipalities are creatures of state law. Public universities and community colleges also depend on the states for substantial portions of their budgets. And administrative bodies like workforce investment boards also have their administrative boundaries set by the state.

In view of that, states (like the federal government in its sphere) can use incentives in the allocation of resources to entice entities to collaborate together on cluster-related activities. States governments, for example, can use cluster information as a criterion in awarding R&D grants, or they can set aside funds for applications involving three or more partners, or make development awards or workforce training investments contingent on the presence of a well-designed cluster strategy. Given the current fiscal climate, however, it might make sense for the state to consolidate administrative entities wherever possible to achieve a true metropolitan focus on clusters and the strategies that support them.

At any rate, the role of the states is going to be important: In a dynamic republic like the U.S., state innovations matter a lot.

In the 1990s, for example, a first generation of state experiments and implementation in the 1990s has informed today's belated but significant federal embrace of cluster paradigms and strategies. Now, it is likely that a new round of state experimentation and implementation on regional innovation clusters will serve as a new prod and test-bed for federal implementation in the coming years.

4. Regional leaders should identify cluster challenges and coordinate cluster actors.

Metropolitan areas and nearby rural regions, finally, are ultimately the places where clustering transpires, and so what happens at the regional or local-government level matters inordinately. Yet the needed work at this level is frequently less about direct government action and more about identifying specific cluster constraints or challenges and then coordinating the activities of relevant actors and networks to remedy them.

Therefore, regional actors and cluster intermediaries should redouble their efforts now to:

- Describe local clusters and identify their binding constraints
- Facilitate regional joint action

To the first point, the most fundamental responsibility of regional cluster participants and intermediaries themselves must be to rigorously **identify local clusters' binding constraints**.

How is this? Such a role flows from the fact that while cluster interventions need to be targeted to address only specific documented performance challenges, only regional actors and participants will likely be able to identify those constraints in detail.

Such analyses require fine-grained, often proprietary or first-hand knowledge and analysis. Consequently, it is regional actors and cluster participants who will be best positioned to supplement the coming federal cluster inventory with the latest local data, first-person survey information, and real-time market intelligence so as to pinpoint the cluster's institutional deficiencies or true resource needs. The bottom line: The most basic contribution of regional actors to a smart national cluster push going forward will be to develop rigorous, objective accounts of local clusters' crucial shortcomings. These will become the basis for collective action.

Otherwise, regions are preeminently the geography within which the bottom-up mutual aid efforts of clusters are organized, and so the other top activity of regional actors will continue to be to ensure the strong self-organization of **regional joint action** in the region's cluster.

Cluster leadership can be taken by different entities or leaders at different times. In greater Louisville, existing clusters in logistics and transportation and health care get a boost from the Metro Chamber of Commerce facilitating collaborative relationships with industry players.[83] The private sector also takes a lead in Detroit, where the trade association Automation Alley provides technology-oriented companies with linkages to regional resources and international export markets to accelerate the commercialization and market transfer of new high-tech products and services.[84] Meanwhile, universities are key cluster leaders, engaged in collaborative R&D and other joint innovation efforts, in both Colorado and San Diego, where the Colorado Renewable Energy Collaboratory spurs cleantech growth in the former, and CONNECT enhances biotech, wireless, and other technology sector growth in the latter.[85] And while philanthropy plays a crucial role in Northeast Ohio to support the economic competitiveness of regional biosciences, clean energy, and advanced manufacturing industries, it is the metropolitan planning organization in Puget Sound that identifies growing and emerging high-impact industry clusters and targets resources to them.[86]

Going forward, these and other region-oriented entities must and will continue to take a lead in defining the next generating of emergent best practices in cluster-based initiatives and policymaking. For example, leaders in San Diego and Seattle are stepping up to support the linkage of existing clusters to new growing sectors—wireless health, born of the biotech and wireless tech companies in the former, and interactive media, arising from the design and IT industry concentrations in the latter.[87] Likewise, the artisanal cheese cluster in Vermont and a nascent aging care industry in Louisville are examples of regions carving out niches where their firms and assets can add specialized value within broader industries—in these cases, dairy and health care, respectively.[88] And finally, regional leaders in Northeast Ohio and along Florida's Space Coast showcase proactive efforts to tune existing industry concentrations—in these cases auto-related suppliers and NASA-affiliated contractors, respectively—to new market opportunities in growing sectors like clean energy and homeland security.[89]

5. Local policymakers should bring to tools to influence on-the-ground implementation of cluster-oriented economic development.

In many cities and metropolitan areas, city managers, mayors and other local elected officials can play a critical convening role, tasking key leaders in the community to commence cluster analyses and form strategic partnerships that

take on cluster-related activities. For example, city governments in both San Jose and Philadelphia are taking a lead in analyzing and advancing the green economy in their respective cities and regions through activities like establishing a cleantech incubator and coordinating how to leverage federal dollars in expanding retrofit markets and commercializing and deploying new energy efficiency technologies and services.[90]

In these and other places, mayors and county executives bring valuable tools to the table for actually implementing cluster-oriented economic development on-the-ground. Most notably, the can:

- Determine the physical infrastructure in which an industry cluster exits

- Spot the broader demographic and social context in which new industry cluster might form and to which existing ones must adjust

For starters, local officials **control and manage the zoning and permitting issues** that can determine how quickly, where, what kind of infrastructure exists to support the growth and development regional industry clusters. At the same time, local leaders are also more likely than other community leaders **to see the broader demographic and social context** within which economic clusters nest.

In fact, the broader context may actually provide the fuel for the formation of new and increasingly important clusters in sectors like health care. In many cities and metropolitan areas, for example, the demographics of aging are juxtaposed with the demographics of diversity. As the country ages, it is expected that the explosion of jobs in the home health care arena will be filled by immigrants working, perhaps, for immigrant entrepreneurs. Mayors and county leaders can play an important role in spotting the demographic underpinnings of business trends and take the steps necessary to ensure that these natural consumption clusters emerge in a way that provides quality care, generates quality jobs and realizes the potential of savings from elderly individuals avoiding early institutionalization. Political leadership to connect the dots between hospitals, emerging firms, labor market intermediaries like community colleges and other interested and supporting parties could be critical.

V. CONCLUSION

Clusters and cluster strategies have surfaced again in economic policy discourse because they have the potential to accelerate regional economic growth and assist with the nation's needed economic restructuring.

More a paradigm than a program, clusters are neither a shiny new fad, a silver bullet, nor ethereal, but instead represent a grounded source of practical value to businesses, workers, and policymakers.

At a time of tepid growth, cluster strategies possess documented *power* to help power regional economic growth by boosting innovation, entrepreneurship, wages, employment, and business specialization.

At a time of shaken confidence in past growth models, cluster frameworks point to the centrality to national wellbeing of practical economic systems in regions, and so offer a fresh *paradigm* for new thought about national economic management.

And finally, as a policy framework clusters provide a practical tool for *policy coordination* and possibly increased return on public investments. Just as clusters deliver significant productivity advantages to groups of firms, suppliers, and related actors and institutions that draw mutual advantage from locating near each other, so too do cluster-oriented initiatives allow for coordinated efforts, maximized impact through realized synergies, and the tuning of interventions to the needs of the real economy in real places.

Such opportunities for impact, clarification about what matters, and the coordination of disparate efforts for greater impact will grow only more important in the coming era of intensified competitive pressure and straightened circumstances.

NOTES

[1] Among the major economists who have called for a new growth model is Lawrence Summers, director of the National Economic Council in the Obama administration. See Lawrence H. Summers, "Rescuing and Rebuilding the U.S. Economy: A Progress Report," address at the Peterson Institute for International Economics, July 17, 2009, available at www.iie.com/publications/papers/paper.cfm?ResearchID=1264. Earlier, in 2007,Summers alluded to the importance of clusters and wrote that "we need to support clusters of extraordinary performance." In a blog post, he continued: "Rather than focus on each individual as an island unto him or herself, the U.S. needs to focus on fostering clusters of innovation—such as Silicon Velley in information technology, Boston in the life sciences, New York in finance—where each talented individual derives his or her strength from all that is around." See Larry Summers, "America must not surrender its lead in life sciences," FT.com / Economists Forum, January 29,2007. Available at http://blogs.ft.com/economistsforum/2007/01/america-must-nohtml/ Among major commentators who have supported the importance of clusters and public as well as private efforts to bolster them is David Brooks of *The New York Times*. See David Brooks, "An Innovation Agenda." *The New York Times,* December 7, 2009; and also David Brooks, "The Long Strategy." *The New York Times,* July 26, 2010. Finally, the Brookings Institution, the Center for American Progress, and the Council on Competitiveness have each highlighted the importance of regional industry and innovation clusters. See Karen Mills, Elisabeth Reynolds, and Andrew Reamer, "Clusters and Competitiveness: A New Federal Role for Stimulating Regional Economies." (Washington: Brookings Institution, 2008), available at www.blueprintprosperity.org. See also Jonathan Sallet, Ed Paisley, and Justin Masterman, "The Geography of Innovation: The Federal Government and the Growth of Regional Innovation Clusters." (Washington: Center for American Progress, 2009), available at www.scienceprogress.org/wp-content/uploads/2009/09/eda_paper.pdf and Council on Competitiveness, "Collaborate! Leading Regional Innovation Clusters." (Washington, 2010), available at www.compete.org/images/uploads/File/PDF%20Files/Final_Collaborate.pdf.

[2] For one review of these developments see National Economic Council, "A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs." 2009. Available at www.whitehouse.gov/administration/eop/nec/Strategyfor AmericanInnovation/

[3] Ibid.

[4] Summers decried the excesses and lack of balance of the recent U.S. growth model in "Rescuing and Rebuilding the U.S. Economy.. Other voices have also critiqued past growth frameworks and policy stances for promoting excess consumption, neglecting production, and embracing a too-simple laissez-faire that has ignored the important role of market failures, institutions, and the interactions of various actors. See, for example, Robert Atkinson, *Supply-side Follies: Why Conservative Economic Fails, Liberal Economics Falters, and Innovation Economics is the Answer.* (Maryland: Rowman & Littlefield Publishers, Inc, 2006); Gregory Tassey, "Rationales and Mechanisms for Revitalizing U.S. Manufacturing R&D Strategies" (Washington, National Institutes of Standards and Technology, 2009); Bruce Katz, "The Next Economy: Transforming Energy and Infrastructure Investment" (Washington, Brookings Institution, 2010).

[5] For a thorough review of cluster definitions, cluster micro economics, and other literature see Joseph Cortright, "Making Sense of Clusters: Regional Competiveness and Economic Development" (Washington: Brookings Institution, 2006). Available at

www.brookings.edu/reports/2006/03cities_cortright.aspx For another full treatment of the intellectual roots of cluster thinking see also Michael Porter, "Clusters and Competition: New Agendas for Companies, Governments, and Institutions" in Michael Porter, *On Competition* (Boston: Harvard Business School Press, 1998).

[6] See Emilia Istrate, Jonathan Rothwell, and Bruce Katz, "Export Nation: How U.S. Metros Lead U.S. Growth and Boost Competitiveness" (Washington: Brookings Institution, 2010). Available at http://www.brookings.edu/reports/2010/0726_exports_istrate_rothwell_katz.aspx. Employment and establishment data are 2008 estimates from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages, Aerospace Products and Parts Manufacturing (NAICS 3364). Employment through 2009 fell to 35,000 and establishments grew to126.

[7] Office of Gov. Bill Ritter, Jr. 2010. "CO's New Energy Economy is a Roadmap for Other States." Press release. May 3. www.colorado.gov/cs/Satellite?c=Page&childpagename=GovRitter%2FGOVRLayout&cid=1251574197116&pagename=GOVRWrapper

[8] Team NEO, "Cleveland Plus Quarterly Economic Review." Vol. 3 Iss. 1. March 2009.

[9] Richard Florida, "The World is Spiky," *The Atlantic Monthly,* October 2005, pp. 48-51.

[10] Mark Muro and others, "MetroPolicy: Shaping a New Federal Partnership for a Metropolitan Nation," (Washington: Brookings Institution, 2008).

[11] Research from the Federal Reserve Bank of Philadelphia, for instance, notes that patents not only proliferate markedly with increased employment density but tend to be cited within the same metropolitan area. See Gerald Carlino, Satyajit Chatterjee, and Robert Hunt, "Urban Density and the Rate of Invention." Working Paper 04-16/R (Federal Reserve Bank of Philadelphia, 2006). Likewise, Acs and Mueller (2008), for their part, found that 40 percent of high impact "gazelle" firms are located in only 20 metro areas, generally the largest. See Zoltan Acs and Pamela Mueller, "Employment effects of business dynamics: Mice, Gazelles and Elephants," *Small Business Economics* 30 (2008): 85-100. Ciccone and Hall established the relationship between the density of economic activity and labor productivity when they found that more than half of the variance in output per worker across states could be explained by differences in employment density. See Antonio Ciccone and Robert Hall, "Productivity and the Density of Economic Activity," *American Economic Review* 86 (1) (1996): 54-70. For general discussions of "agglomeration economies" see, among others, Edward Glaeser, et al., "Growth in Cities," *Journal of Political Economy* 100 (6) (1992): 1126-1152 and Stuart Rosenthal and William Strange, "Evidence on the Nature and Source of Agglomeration Economies." In J.V. Henderson and J. F. Thisse, ed., *Handbook of Regional and Urban Economics*, vol. 4 (Amsterdam: Elsevier, 2004).

[12] Brookings analysis of output data from the Bureau of Economic Analysis Regional Economic Accounts (2008); new firm births data from the Small Business Administration's Office of Advocacy (2006); and granted patents data from the U.S. Patent and Trademark Office (2008).

[13] Alan Berube, "MetroNation: How U.S. Metropolitan Areas Fuel American Prosperity." (Washington: Brookings Institution, 2007). Available at http://www.brookings.edu/~/media/Files/rc/reports/2007/1106_metronation_berube/MetroNationbp.pdf

[14] Michael Porter, "Clusters and Economic Policy: Aligning Public Policy with the New Economics of Competition." White Paper. (Cambridge: Institute for Strategy and Competitiveness, 2009).

[15] Mills and others, "Clusters and Competitiveness." For a trenchant review of how such policy preferences reflect deep-seated economic doctrines and especially those of the long neoclassical tradition see Robert Atkinson and David Audretsch, "Economic Doctrines and Policy Differences: Has the Washington Policy Debate Been Asking the Wrong Questions? (Washington: Information Technology and Innovation Foundation, 2008). Available at http://www.itif.org/files/EconomicDoctrine.pdf

[16] See Gregory Tassey, *The Technology Imperative*. (Cheltenham, UK: Edward Elgar, 2007) and Gregory Tassey, "Rationales and Mechanisms for Revitalizing U.S. Manufacturing R&D Strategies," *Journal of Technology Transfer* 35 (3): 283–333.

[17] Robert Atkinson and Howard Wial, "Boosting Productivity, Innovation, and Growth through a National Innovation Foundation." (Washington: Brookings Institution, 2008). Available at www.blueprintprosperity.org

[18] Atkinson and Audretsch, "Economic Doctrines and Policy Differences."

[19] This definition is adapted from that provided in Mills and others, "Clusters and Competitiveness" and in turn from that in Michael Porter, *On Competition.* (Boston: Harvard Business School Publishing, 1998).

[20] Michael Porter, "Clusters and the New Economics of Competition." *Harvard Business Review* (November-December 1998): 77–90.

[21] Economists have long acknowledged the presence of agglomeration forces that pull businesses and people into cities and enhance their productivity. At the broadest level, irrespective of industries, economists call these agglomeration forces "urbanization economies." The theory underpinning urbanization economics is most strongly associated with Jane Jacobs, with empirical support from Glaeser and colleagues and more rigorous theoretical grounding in Lucas. For reviews of the urbanization literature see Gilles Duranton and Diego Puga, "Microfoundations of Urban Agglomeration Economies." In J.V. Henderson and J. F. Thisse, ed., *Handbook of Regional and Urban Economics*, vol. 4 (Amsterdam: Elsevier, 2004). Yet cluster thinking goes beyond urbanization to what economists call "localization"—the notion that important benefits accrue not just to geographic concentrations of business generally but to concentrations *within a particular field.* At first glance, it is difficult to distinguish urbanization *per se* from clustering, or "localization." However, a rich economics literature now deals with this distinction and contends that important benefits do arise specifically from localization, or clustering. See, for example, such thorough reviews of the "location" literature as Stuart Rosenthal and William Strange, "Evidence on the Nature and Sources of Agglomeration Economies." In J.V. Henderson and J. F. Thisse, ed., *Handbook of Regional and Urban Economics*, vol. 4 (Amsterdam: North-Holland, 2004); and Joseph Cortright, "Making Sense of Clusters: Regional Competitiveness and Economic Development" (Washington: Brookings Institution, 2006).

[22] Michael Porter, *The Competitive Advantage of Nations* (New York, Free Press, 1990).

[23] See Maryann Feldman, *The Geography of Innovation.* Dordrecht: Kluwer Academic Publishers, 1994 and David Audretsch and Maryann Feldman, "Knowledge Spillovers and the Geography of Innovation." In J. Vernon Henderson and Jacques-Francois Thisse, eds., *Handbook of Regional and Urban Economics*, vol. 4 (Amsterdam: Elsevier, 2004: pp.2120–2167). And Maryann Feldman, "The New Economics of Innovation, Spillovers, and Agglomeration: A Review of Empirical Studies,"Gordon L. Clark, Maryann Feldman, and Meric Gertner,*The Oxford Handbook of Economic Geography.* (New York: Oxford University Press, 2002).

[24] See AnnaLee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. (Cambridge: Harvard University Press, 1994); Porter, "Clusters and Competition;" and Mercedes Delgado, Michael Porter, and Scott Stern, "Clusters and Entrepreneurship," *Journal of Economic Geography* 10 (2010): 495–51

[25] See Greater Wichita Economic Development Council, "Key Industries: Aerospace," available at www.gwedc.org/key_industries-aerospace.php (accessed September 2010).

[26] For an overview of BioCrossroads' activities, see "BioCrossroads Overview," available at www.biocrossroads.com/UserFiles/File/2010-BioCrossroads-Overview.pdf (2010). For a detailed look at the contract discovery and development interrelationships in Indiana, see BioCrossroads, "Discovery and Development Contract Services—Indiana Market Opportunities and Funding Options: An Analysis of the Pharmaceutical and Biotech Development and Manufacturing Sector" (Indianapolis, 2008). Available at www.biocrossroads.com/UserFiles/File/Biopharma_discovery_and_development_contract_services_report_Jan._08.pdf.

[27] See for example: Adam Jaffe, Manuel Trajtenberg, and Rebecca Henderson, "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations," *Quarterly Journal of Economics* 108 (3) (1993): 577-598; David Audretsch and Maryann Feldman, "R&D Spillovers and the Geography of Innovation and Production," *American Economic Review*, 86 (3) (1996): 630-640; and Jung Won Sonn and Michael Storper, "The increasing importance of geographical proximity in knowledge production: an analysis of US patent citations," *Environment and Planning* 40 (2008): 1020-1039.

[28] See Saxenian, *Regional Advantage,* for early discussions of clusters' support of entrepreneurship. On wages, see Robert Gibbs and G. Andrew Bernat Jr., "Rural Industry Clusters Raise Local Earnings," *Rural Development Perspectives* 12 (3) (1997): 18–25 and William Wheaton and Mark J. Lewlis, "Urban Wages and Labor Market Agglomeration," *Journal of Urban Economics* 51 (3) (2002): 542–562. On the influence of clusters on broader regional economic performance see Porter, "Economic Performance of Regions."

[29] Academic opinion about the wisdom and efficacy of government engagement in cluster initiatives or cluster initiative programming remains skeptical. While Michael Porter and many European analysts insist on the need for limited but significant government intervention to support clusters, some prominent urban economists either believe that competitive clusters emerge organically and see no role for government intervention, or remain suspect of the government's ability to design and implement an effective cluster policy. There is widespread agreement, however, that pervasive market failures prevent clusters from reaching or maintaining their optimal size; the debate is whether or not these can be effectively redressed. For a positive view of government and specifically federal engagement see Michael Porter, "Clusters and Economic

Policy." For a skeptical consideration see Gilles Duranton, "California Dreamin': The Feeble Case for Cluster Policy," (London: Center for Economic Policy Research, 2009).

[30] Mills and others, "Clusters and Competitiveness." Obtaining an accurate inventory of U.S. cluster initiatives remains extremely difficult. In correspondence on August 25, 2010, Dr. Christian Ketels of the Institute for Strategy and Competitiveness' Cluster Mapping Project and the European Cluster Observatory suggested a lower bound of 150 active cluster initiatives in the U.S., based on information from a 2005 survey. In Europe, where greater funding for cluster activities is available, the Observatory tallies 1,300 initiatives. Ketels and colleagues have identified approximately 100 cluster initiatives in Japan that have received funding through the two major government cluster programs.

[31] Ibid.

[32] See *Budget in Brief, FY 2010*, (U.S. Department of Commerce), pp. 33, 38. Available at http://www.osec.doc.gov/bmi/BUDGET/10BIB/2010%20budget%20in%20brief%20final.pdf

[33] See Andrew Reamer and Mark Muro, "Congress Directs EDA to Act on Clusters." *The Avenue,* a blog of *The New Republic*, December 17, 2009. Available at www.tnr.com/blog/the-avenue/congress-directs-eda-act-clusters

[34] The Department of Energy website for the E-RIC building sciences hub is here: www.energy.gov/hubs/eric.htm. The press release for the final award to a Phialdelphia-based consortia is here: www.energy.gov/news/9380.htm

[35] See Mark Muro, "Energy Hubs + Clusters = A New Vision for Innovation." *The Avenue,* a blog of *The New Republic*, February 16, 2010. Available at www.tnr.com/blog/the-avenue/energy-hubs-regionalism-new-vision-innovation

[36] See Sarah Rahman and Mark Muro, "Industry Clusters as a Paradigm for Job Growth." *The Avenue,* a blog of *The New Republic*, February 2, 2010. Available at www.tnr.com/blog/the-avenue/budget-2011-industry-clusters-paradigm-job-growth

[37] *The Department of Commerce Budget in Brief: Fiscal Year 2011*, (Department of Commerce, 2010), pp. 2, 41, 46. Available at /www.osec.doc.gov/bmi/budget/11BiB/2011_BiB.pdf

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