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Clusters and Economic Policy:
Aligning Public Policy with the New Economics of Competition

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The fundamental goal of economic policy is to enhance competitiveness, which is reflected in the productivity with which a nation or region utilizes its people, capital, and natural endowments to produce valuable goods and services. High and rising productivity, measured by the value produced by a day of work, determines the level of wages that a nation can sustain and its standard of living in the medium and long run.

Economic policy to enhance competitiveness, 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, investments in basic R&D, public support of colleges and universities, infrastructure investments, and antitrust regulations.[1] On the other extreme, policies have sought to benefit the competitiveness of *individual* firms and 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 targeting small businesses, and SBIR grants.

Past policy initiatives aimed at levels in between the general business environment and individual firms have been widely discredited, and rightly so. Industrial policy, which focuses on supporting individual industries, is distortive and interventionist. Picking winners, and attempting to nurture them through subsidies and protection, rarely succeeds.

Another example of policy falling between the general business environment and individual firms is support for the manufacturing sector, based on the assertion that manufacturing activities have special importance for the economy. However, the distinction between manufacturing and services is increasingly blurred and arbitrary. Moreover, many manufacturing jobs require limited skills and are migrating to low wage locations. Today, it is not manufacturing per se that makes for good jobs, but the level and technology and skills involved.

However, a crucial locus for federal economic policy has been largely ignored, which is clusters. Clusters are a striking feature of all modern economies.[2] They are geographic concentrations of firms, suppliers,

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[1] Many Federal policies to address the general business environment are national in scope, such as Federal taxation and antitrust. Other policies are implemented through states or in some cases through localities, such as transportation infrastructure financing and workforce development. States have been gaining more discretion in recent decades in program implementation.

[2] For a description of the concept of clusters and their impact on competition, see Porter (1990) and (1998). Additional useful material on clusters is cited in the bibliography and can be accessed on the website of the Institute for Strategy and Competitiveness (isc.hbs.edu).

support services, specialized infrastructure, producers of related products, and specialized institutions (e.g., training programs and business associations) that arise in particular fields in particular locations. Clusters often involve a mix of manufacturing and services, and combine industries in different parts of traditional industrial classification systems. Clusters as an economic unit, then, are very different from sectors (such as manufacturing) or industries (such as tires). Examples of U.S. clusters are money management in Boston, light aircraft in Wichita, entertainment in Los Angeles, information technology in Silicon Valley, and boat building in Maine.

Clusters consist of dense networks of interrelated firms that arise in a region because of powerful externalities and spillovers across firms (and various types of institutions) within a cluster. Clusters drive productivity and innovation. Firms that are located within a cluster can transact more efficiently, share technologies and knowledge more readily, operate more flexibly, start new businesses more easily, and perceive and implement innovations more rapidly. They can also efficiently access "public goods" such as pools of specialized skilled employees, specialized infrastructure, technological knowledge, and others. Clusters embody traditional notions such as input-output linkages, but much more. Because of the importance of physical proximity in reaping cluster benefits, clusters are often regional instead of national except in small countries such as Singapore.

The mix of clusters varies markedly across regions. Each regional economy normally has a relatively small number of traded clusters in which the region is truly competitive with other regions and countries. These clusters account for a major portion of the region's traded goods and services. There is no national economy, then, but a series of regional economies that trade with each other and the rest of the world, each with its own particular pattern of cluster specialization. Such regional specialization drives productivity and productivity growth in the national economy. There is growing statistical evidence that regions with stronger clusters achieve better economic performance and faster innovation.[3]

Clusters represent an increasingly important economic unit, then, but one that has been all but ignored in policymaking at the Federal level in the United States. In this paper, I describe why clusters are a prominent feature of modern economies and why a role for public policy at the cluster level is justified by economic theory. Cluster-based policies should increasingly replace industry-level and firm-level policies, because cluster policy is more efficient, minimizes distortions to competition, and is better aligned with the nature of competition in the modern economy. I then sketch some implications of clusters for policy at the Federal level.

The Growing Role of Clusters in Competition

Clusters have long been a feature of economic geography, but their influence on competition has grown with the shifting nature of competition and the restructuring of how companies operate. Competition in advanced economies is increasingly driven by knowledge and skill, with low cost labor and other resources accessed in cheaper locations. Clusters are important because they play a fundamental role in knowledge creation, innovation, the accumulation of skills, and the development of pools of employees with specialized expertise.

Clusters also gain in importance as firms migrate from vertically integrated structures, in which they perform most activities internally, to structures involving the outsourcing of many activities and functions to outside entities. Outsourcing includes not only traditional parts production, support services, and the like, but also contract manufacturing, managing IT systems, training, and even research and development.

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[3] The empirical literature on the role and impact of clusters is growing. See Feldman and Audretsch (1999); Swann et al., (1998); Porter (2004); Delgado, Porter, and Stern, "Clusters and entrepreneurship" (2010); and Delgado, Porter, and Stern, "Convergence, Clusters and Economic Performance" (2010).

Outsourcing takes place not only to other firms but to non-business entities such as technical schools, university research institutions, and industry association programs.

Finally, globalization has made clusters more, not less, important. Falling barriers to trade and investment have exposed more and more locations to competition, allowing strong clusters to grow stronger while ineffective locations lose position. Globalization neutralizes many sources of competitive advantage that can be sourced or accessed by any firm from a distance, such as cheap labor, raw materials, or generic technology. Paradoxically, then, this means that the advantages of clusters are **more important** in global competition, not less so. As firms depend more on outside firms, support services, and local institutions, it becomes more important to locate within a strong cluster to access benefits that are difficult for outsiders to tap.

Clusters consist not only of large firms, but have proliferated the opportunities for small and medium sized firms to fill important needs and niches in the cluster. Large firms continue to grow and internationalize, but the preponderance of job creation has been in smaller firms for the last several decades. Increasingly small and medium-size firms compete internationally, not just large ones.

Cluster networks span groups of tightly connected industries linked by supplier-buyer relationships, common technologies or skills, and other forms of externalities. Biopharmaceutical and skin care producers often co-locate in the same cluster locations, for example, because they draw on common skills, research programs, manufacturing needs, and packaging. Cluster externalities often extend across political boundaries to neighboring regions, which recent empirical evidence has verified.[4]

Cluster can overlap with other clusters. For example, biopharmaceutical clusters, chemical clusters, and medical device clusters tend to locate in the same regions because of externalities in technology, sourcing, and other areas. Regions with a presence in overlapping clusters are more competitive, as new statistical research has demonstrated.[5] Also, the diversification of regional economies often occurs as new clusters emerge that are related to the clusters already present.

Clusters are key drivers of job growth, wage growth, new business formation, and innovation. In any region, there is a mix of traded and local economic activity.[5a] Local industries, such as eating establishments and public utilities, are present in every region. They account for a large part of employment, but serve almost exclusively the local market and the population living there. *Traded clusters*, which produce products and services that compete with those produced by other regions and other countries, are the underlying drivers of prosperity. Traded clusters, because they serve broader markets, can grow employment and exports well beyond local needs. Traded clusters, which have far higher average wages than local industries, create the income to afford sophisticated local services and the demand for local industries to grow beyond the size of the local population per se.

Clusters normally arise at the level of regions or economic areas, not entire nations, because of the importance of proximity to cluster benefits. This is why regional economies specialize , and why regional economies are a crucial unit in understanding economic performance. Economic policy, then, must not just focus on the national level but the regional and local levels.

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[4] See Delgado, Porter, and Stern, "Clusters and entrepreneurship" (2010) and Delgado, Porter, and Stern, "Convergence, Clusters and Economic Performance" (2010).
[5] Ibid.
[5a] See Porter (2003).
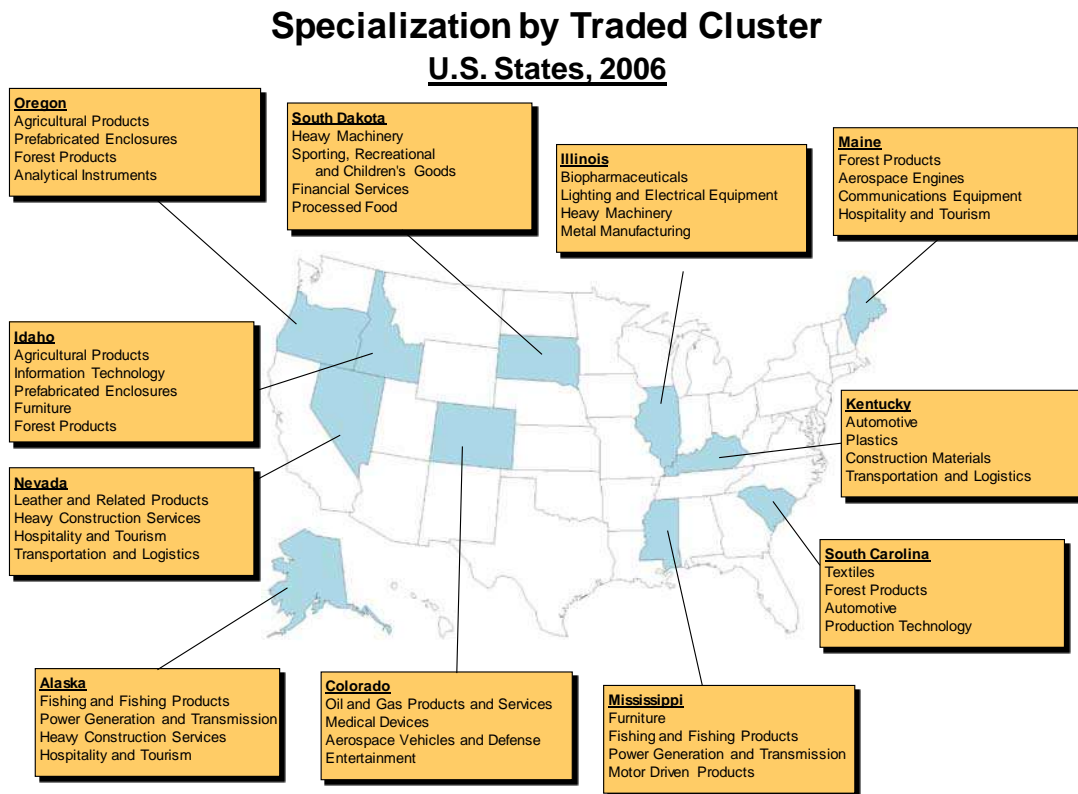
Measuring Clusters

While the existence of clusters has been long recognized, the ability to systematically measure clusters and examine their influence on regional performance is relatively recent. Most work on clusters has been based on case studies or utilized ad hoc cluster definition based on the judgment of the analyst. While this work has advanced our knowledge, new tools are needed and have been developed to define cluster boundaries and measure the overlaps among clusters more rigorously.

The Cluster Mapping Project at Harvard Business School has utilized the locational correlation of employment in pairs of industries to define cluster boundaries across the entire economy.[6] The data reveal 41 traded clusters, each of which can be divided into a number of subclusters of industries whose locations are ever more strongly correlated. The Cluster Mapping Project utilizes these definitions to map the cluster composition of every Economic Area in the U.S., and show how the mix and strength of clusters in each region has been changing. Cluster mapping reveals the distinctive economic geography of each region. The data also allows an analysis of employment, employment growth, wage rates, and patenting by cluster and sub-cluster for each region, as well as a deep understanding of overall regional performance.

Figure 1 shows a map of the U.S. which reveals the leading clusters in a selection of regions.

On average, the top five clusters account for 52% of traded employment in U.S. Economic Areas. The average Economic Area has seven clusters with a location quotient of 1.5 or above (a measure of cluster strength), which signifies a disproportionate representation in the region.

Figure 1

Specialization by Traded Cluster
U.S. States, 2006

Oregon
Agricultural Products
Prefabricated Enclosures
Forest Products
Analytical Instruments

South Dakota
Heavy Machinery
Sporting, Recreational
   and Children's Goods
Financial Services
Processed Food

Illinois
Biopharmaceuticals
Lighting and Electrical Equipment
Heavy Machinery
Metal Manufacturing

Maine
Forest Products
Aerospace Engines
Communications Equipment
Hospitality and Tourism

Idaho
Agricultural Products
Information Technology
Prefabricated Enclosures
Furniture
Forest Products

Kentucky
Automotive
Plastics
Construction Materials
Transportation and Logistics

Nevada
Leather and Related Products
Heavy Construction Services
Hospitality and Tourism
Transportation and Logistics

South Carolina
Textiles
Forest Products
Automotive
Production Technology

Alaska
Fishing and Fishing Products
Power Generation and Transmission
Heavy Construction Services
Hospitality and Tourism

Colorado
Oil and Gas Products and Services
Medical Devices
Aerospace Vehicles and Defense
Entertainment

Mississippi
Furniture
Fishing and Fishing Products
Power Generation and Transmission
Motor Driven Products

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[6] For a description, see Porter (2003) and the Cluster Mapping Project at http://www.isc.hbs.edu/cmp/index.html.

These data allow rich understanding of regional economic geography in the U.S. (including local clusters) and an analysis of its causes. Cluster mapping also provides an objective definition of those clusters in which a particular region has a meaningful presence. This provides a sounder basis for cluster policy than previous ad hoc approaches.

While cluster mapping data is currently available only for the U.S. and Canada, a less detailed cluster mapping of the European Community using consistent definitions is now available.[7] Similar efforts are underway or being planned in Mexico and some other countries.

The Role of Public Policy in Clusters

Clusters emerge spontaneously based on market forces, and the process of cluster formation will occur naturally as new firms form, suppliers develop, infrastructure investments respond to local needs, specialized institutions grow, and established firms elsewhere locate operations in growing cluster concentrations. Given such spontaneous economic processes responding to market signals, should clusters just be left alone to develop naturally?

Since clusters involve powerful externalities across firms in a location, and associated public goods, there is a strong rationale for public policy. In the presence of positive externalities, market failure will lead to underinvestment in specialized skills, scientific knowledge, and specialized infrastructure that benefits the entire cluster while also increasing competition through lowering the barriers to entry of new firms. Public policy that provides rules, mechanisms, and incentives for capturing external economies will improve productivity and, with it, job, wage, and innovation growth.

Public policy at the cluster level should begin with the collection of *information* that identifies the existence of clusters, which are obscured by standard industrial classification systems. Government has an important role in assembling information about cluster composition, membership, employment, and performance. Such information will allow public policies and public investments to be better aligned with business needs, based on the cluster composition in each location. This will make public policy more relevant and effective. Cluster information will also increase the efficiency of private sector investment and foster new business formation to capitalize on cluster presence and capabilities.

Another potential role for government in cluster development is to *convene* cluster participants if private sector institutions have not already arisen to do so. Once clusters are organized through trade associations or other means, government agencies need to become active participants in dialogs with cluster participants to understand local constraints to productivity and identify gaps and weaknesses in public policy.

Another dimension of cluster policy is *incentives* to spur collective investment by cluster participants in assets that benefit many cluster participants, such as university research centers, community college curricula, or testing facilities. In some cases, public investment in assets involving cluster externalities is also justified.

Public policy at the cluster level, in contrast to policy at the industry or firm level, avoids the inefficiencies, moral hazard, potential distortions, and dubious rationale of many narrowly targeted policies such as innovation grants for particular firms, or single industry technical assistance programs. The case for a public role in training, for example, is much stronger at the cluster level than at the industry

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[7] European Cluster Observatory, "European Cluster Observatory," European Cluster Observatory Web site, http://www.clusterobservatory.eu/, accessed December 2008.

or firm level because training investments will benefit numerous firms with little risk of distorting competition.[8]

Cluster-based policies, unlike sectoral or industrial policies, should be **neutral** with regard to industry or type of economic activity. In cluster theory, all clusters are good. Enhancing cluster externalities and spillovers will increase productivity and prosperity in **any** cluster. Hence government should not choose among clusters but create policies that support upgrading in every cluster present in a location. Cluster policy is thus fundamentally different from sectoral or industrial policy, whose fatal flaw is their focus on favoring particular types of economic activity, picking winners, and attempting to artificially bias competition in favor of a particular country or region.

Sound cluster policy is pro-competition. Cluster-based policy mitigates against the collusion risk present in industrial policy because of the involvement in clusters of suppliers, customers, and other actors rather than just competing firms in a single product area.

Implications of Clusters for Federal Policy

There is also a strong rationale for cluster-based economic development policies at the Federal level, in addition to at the regional level. A cluster approach will foster positive cluster externalities, while allowing Federal policies to be implemented more effectively by better connecting them to actual state and local economies. In addition, Federal policy based on cluster principles will reinforce economic specialization across states and regions, increasing productivity and productivity growth. Thus, cluster-based policies reinforce a positive sum competition across states and regions, rather than the current approach where Federal investments often distort economic geography through subsidies or political influence.

Note that cluster policy does *not* imply large capital investments or increases in program funding. Instead, cluster-based policy thinking is focused on improving the *effectiveness* of existing public policies in making better policy choices, engaging the private sector in public-private initiatives, and making existing economic development programs far more effective.

Cluster-based Federal policy should embody the following principles:

<u>Avoid Policies Oriented Towards Individual Firms and Industries</u>

Unless there are compelling market failures at the firm level, such as the well known incentive for individual firms to underinvest in technology or gaps in capital access, Federal and even state policies targeted at the level of individual firms are to be avoided. They will be inefficient, producing limited benefits and involving high implementation costs. They run grave risks of introducing subsidies and other market distortions into competition. Policy at the industry level shares many of these problems, while failing to address the linkages across industries and institutions that drive productivity. Industry-based policies can also limit competition and foster collusion. In cluster-based policies, collusion is checked by the participation of suppliers, channels, independent institutions, and other actors, that will police anticompetitive actions by any one group.

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[8] Note that there is a rationale for public investment in training even at the firm level because trained workers may leave an individual firm but benefit the economy as a whole. Here, firms will underinvest in training from society's viewpoint.

Use Clusters as an Integrating Approach to Federal Economic Policy

Currently, there are disparate, uncoordinated Federal economic policies covering a wide array of discrete policy areas. Clusters provide an integrating mechanism for bringing these policies and programs together into an overall strategy for improving competitiveness. Policy design and coordination can be improved substantially.

Organize the Implementation of Federal Economic Programs Around Clusters

There are numerous Federal economic development policies and programs such as workforce development, export promotion, investment attraction, infrastructure investment, product regulation, and others. Such programs have been appropriately criticized as often fragmented, duplicative, and inefficient. Federal economic development programs will be more effective and efficient if they are restructured so as to be implemented using the cluster model. Each cluster has different needs that a generic program will fail to address. Also, a cluster-based program implementation approach will lead to spillover benefits for many more firms than programs targeting a single firm or small group of firms.

Cluster-based program implementation improves effectiveness by aligning choices with the true needs of the clusters in each region. A cluster-based workforce training system, for example, will train workers to fill actual jobs in the cluster and meet the actual skill needs of these jobs. This demand-driven approach stands in stark contrast to today's supply-driven training system, organized and governed heavily by training providers. In a cluster-based workforce development model, workers will also be equipped to seek employment in multiple firms in many parts of the cluster, in contrast to training programs that subsidize training in individual firms. This same rationale for a cluster approach applies to most types of economic development programs.

A cluster approach also allows Federal, state and local economic development efforts to be coordinated. To facilitate cluster-based policy implementation, economic development agencies at the Federal, state, and local levels should incorporate clusters into their organizational structures instead of organizing solely around generic policies and program functions. Staff should be assigned to develop expertise in particular clusters to allow for deeper information exchange and better understanding of company needs and priorities.

Use Cluster Designation as a Qualifying Criterion For Incentives For Planning and Collective Private Investments

Because clusters involve productivity-enhancing externalities, there is a clear case for providing incentives for collective private investments in assets benefiting a cluster, and to set policies to facilitate the organization of such collective investments. This rationale is similar to the case of Business Improvement Districts, in which local governments have created a structure to allow many businesses and other organizations operating in a particular community to pool their investments in security, beautification, infrastructure, and the like.

While individual firms will have some incentives to make investments in cluster assets, these incentives will only be large enough to lead to actual investments for very large firms. A public role in organizing collective investments and providing incentives is justified. Investments could include such areas as cluster institutions, environmental remediation programs, standards setting and certification organizations, shared infrastructure, and many others.

Towards a Federal Cluster Program

A Federal program to enable and incentivize cluster-based collaboration could be the following:

Certify Designated Clusters. Cluster groups could voluntarily seek qualification as "Designated Clusters" based on a number of criteria:

- The presence of a minimum concentration of firms and economic activity in a relevant economic region. The region could cut across county, municipal or state boundaries.

- Participation in the group of a broad representation of cluster participants including end product producers, service providers, component suppliers, logistical vendors, distributors, etc. No single type of firm should dominate.

- Participation in the cluster group of a minimum number of associated institutions such as community colleges, universities, training providers, and others

- Participation of relevant levels of government (at minimum the state and involved cities) who are willing to improve regulatory structures and government programs based on input from the cluster

- The existence of a formal cluster convening organization which is inclusive of most cluster participants.[9] This organization could be newly formed.

Cluster groups could self form in any field and region. Any such group, including multiple groups in the same cluster but located in different geographic regions, could apply for certification as Designated Clusters.

Quantitative criteria for minimum cluster size and other metrics that are needed to qualify for Designated Cluster status could be set using data from the Cluster Mapping Project, taking into account the size of the region. However, qualification rules should also allow for clusters not meeting the quantitative criteria to apply based on special circumstances. New clusters can form which are not yet reflected in economic statistics, and the North American Industrial Clarification System, with which data is collected, is imperfect and does not capture relevant industry boundaries in some cases.

Cluster Planning Grants. Designated Clusters would qualify to compete for Federal matching funding for planning, market data collection, competitive assessment, and other approved collective planning activities. Cluster planning grants, which could cover one or two years, would require matching funds by cluster group participants. Matching funds would be raised using an equitable process that did not unduly exclude participants.

Cluster Planning Grants would be awarded based on a competitive process based on the merits of the Designated Cluster proposal, the active participation of the appropriate constituencies, and the group's commitment and track record in implementation. The Department of Commerce, or another designated agency, would conduct the selection process.

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[9] Membership and dues structure would not unduly benefit one class of firms or exclusive participants such as small firms.

States could partner with the Federal government to supplement the pool of funds available for cluster planning grants.

Cluster-Based Program Awards. There are a wide variety of existing Federal programs awarding money for training (Department of Labor), economic development projects (EDA), and numerous other areas. A Designated Cluster could be given preference in competing for matching grants in existing programs, or in a new program designed to encourage other kinds of collective pre-competitive investment. Examples of areas for such investment could include green technology grants, environmental remediation grants, cluster infrastructure grants, standards setting and certification entities, export marketing initiatives, and others.

Cluster group participants would be required to raise matching funding for such projects privately, with rules to ensure reasonable access to the project by smaller companies as well as non-business institutions. The outputs of cluster activities would be open to all cluster group members.

The responsible Federal agencies for each program, or a new program, would select the Designated Clusters to receive the awards, based on standards covering the merit of the proposal and the commitment (and track record) of the cluster group to implement its plan. This general approach was embodied in the WIRED grants awarded by the Department of Labor, and the model can be extended to virtually all existing Federal economic development programs.

Summary

Clusters are a fundamental economic unit in the modern economy, and an important driver of competitiveness. Cluster-based policies have begun to play a prominent role in some U.S. states and regions, and in many other nations, but cluster-based approaches have been all but absent at the Federal level in the U.S. A selective Federal role in cluster-based policy will make Federal economic policy more effective and better utilize the scarce resources available. Federal leadership in cluster-based policy would also encourage cluster-based approaches at the state and local level.

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