

LINKING CLUSTER THEORY, EMPIRICS, AND PRACTICE:

TOWARDS A NEW AGENDA FOR CLUSTER THEORISTS & PRACTITIONERS *

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“For years, busloads of foreign visitors toured Silicon Valley and returned back home with similar prescriptions: The formula for creating a Technopolis is a world class university, an affiliated science park where research can be commercialized, an ample supply of venture capital, a pleasant physical environment, and a stimulating social milieu – a rather superficial analyses, so to speak” – (Preer, 1992)

1—INTRODUCTION

The phenomenon of spatial agglomeration and clustering of economic activity is not a new development in the economics theory and development planning literature and practice. Agglomeration economies have been an issue of some interest for the economics profession ever since Alfred Marshall’s seminal work describing the phenomenon in the nineteenth century Europe (Marshall, 1890). What is new, perhaps, is the revival of the interest in the subject after some extensive work by Professor Michael E. Porter of the Harvard Business School whose 1990 classic “Competitive Advantage of Nations” has become a corner stone of the new competitiveness theory as it applies to countries and regions. Porter describes [economic] clusters as “*geographically proximate group[s] of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities*”. More generally, however, the term economic clusters, has come to define agglomerations of economic activity in space irrespective of whether or not they exhibit the organization and properties defined in Porter’s or several other competing definitions. Porter (1998) describes three broad mechanisms through which clusters affect competition and create a competitive advantage:

- By increasing the productivity of companies based in the cluster;
- By driving the direction and pace of innovation, which underpins future productivity growth; and

Towards A New Agenda for Cluster Theorists and Practitioners

- By stimulating the formation of new businesses, which expands and strengthens the cluster, forming a virtuous circle or positive feedback.

While the earliest known clusters can be traced as back in time as the great cities of the Hellenic and Islamic Empires (e.g. Baghdad, Ephesus, and Cordoba etc.) the more recent examples include economic agglomerations that came into existence in the wake of the industrial revolution in United Kingdom (e.g. Manchester) and later United States (e.g. New York, Boston and other cities of the North East) (Chartres, 2002). Several of these economic clusters came into being as a result of historical accidents and natural processes that reconfigured world's economic landscape. More recently, however, and following the success of Silicon Valley (documented elsewhere, e.g. Saxenian, 1994, and Kenney, 2000), many regions have proactively tried to 'cultivate' economic clusters—especially those focusing on agglomeration of high-technology economic activity—through a mix of policy and public-private interventions in what has sometimes been termed as a 'cluster fever'.

A 1984 study by the Office of Technology Assessment (OTA) identified over 150 state, local government, university, and private initiatives throughout the United States to develop regional high tech. competitive advantages (OTA, 1984). A 1997 report by the Economic Development Administration (EDA) documents 17 cluster initiatives in the US states, including, Arizona, Austin, Oregon, Florida, Ventura, Silicon Valley, and Connecticut. (EDA, 1997) A more recent UK study by Department of Environment, Transport, and Regions (DETR) identified over 2 dozen clusters in the UK and called for policy measures to create more (DETR, 2000). In the European Union, many clusters exist in Germany, Italy, France, and the Netherlands.

In the 1980s, the Japanese Ministry of International Trade and Industry (MITI) spearheaded a 20-year effort to develop 25 research cities around Japan spending about \$200 mn./year/city on infrastructure alone (Preer, 1992). Some of Asia's success stories of the last couple of decades, like Taiwan and Singapore, have also been fueled by cluster-type initiatives (Mathews, 1997, 1999). A number of developing countries have also embraced economic clusters as the central components of their leap-frog strategies and as the panacea of their economic ills with initiatives like Malaysia's Multimedia Super Corridor (MSC), Dubai's Internet City and Oman's Clusters Initiative etc.

Literally hundreds of cluster initiatives, of varying sizes and scope, have been identified all around the world. One study identified 112 cluster initiatives in Northern Europe, 82 in Australia and New Zealand, 107 in Western Europe, and 92 in North America (Solvell et al., 2003). The Cluster Mapping Project at the Institute of Strategy and Competitiveness (ISC) at the Harvard Business School has thus far identified information on 719 clusters from the world, including 23 developing countries (van der Linde, 2001). Another study identified several hundred clusters of varying sectoral and geographical scopes and classified them into several categories, namely, working, latent, potential, and policy-driven clusters (Enright, 2000). The Cluster Meta Study by ISC has also highlighted the growing number of intellectual contributions to the study of economic clusters, including 360 books, reports, and articles on clusters and related topics (van der Linde, 2001). These repeated findings suggest that the concept of economic clusters is far more prevalent, though somewhat controversial as well, than it is often acknowledged to be.

The pervasiveness of the phenomenon of economic clustering has given rise to a *mélange* of policy initiatives aimed at cultivating and sustaining them. These include investment in Basic R&D in expectation of spillovers; development of infrastructure; investments in workforce development; formation of regional alliances; creation of research, science, and business parks; business incubators; university research centers; public venture capital programs; developing economic visions as well as traditional tax and subsidies policy measures. Some of these are more regional economic development policies while others are more ‘cluster-specific’ and explicitly aimed at jumpstarting the process of economic agglomeration.

Not all of these policy prescriptions, however, are well-formulated to stand a strict, or even minimal, evidentiary screening test. Critics have argued for a more cautious and circumspect approach to the use of public policy in the cluster context. Clusters, they believe, are so often misused in policy discourse that “the cluster concept should carry a public policy health warning” (Martin and Sunley, 2003). Another observer acknowledges that “clusters have gate-crashed the economic policy arena...and...cluster policy has become a magic recipe...that is dangerously fashionable” (Cassidy et al., 2005). To further complicate an already confused picture, while activist public policy has often been

employed to create economic clusters, the literature is surprisingly thin about the specific interventions and actions that might have a chance of actually doing so.

More often than not, cluster studies entail a fairly simplistic analysis of the economic activity in a region, often using one of the more popular analytic frameworks that serves to identify and map various economic clusters in a region. It is then implied, explicitly or implicitly, that a policy intervention is warranted to support the region's clusters and/or enhance their competitiveness. This is where the analysis ends, in most instances, and is subsequently overtaken by the euphoria of an aggressive, albeit somewhat vague, policy agenda that is often unsupported by solid empirical evidence of its effect on the economic outcomes of ultimate interest.

This paper looks at the public policy dimension of economic clustering and agglomeration to evaluate our current state of understanding of the practical advice on economic clustering. How do clusters come into being and what can public and private actors do to jumpstart the clustering of economic activity and sustain their evolution through various stages of their life-cycle? In section-2, we present a brief synthesis of our understanding of economic clusters as gleaned from an in-depth study of cluster theory and empirics. This section draws heavily from an exhaustive review of the theoretical and empirical literature done elsewhere (see Osama and Popper, 2005).

In section-3, we briefly review the rationale for public policy intervention to support clustering of economic activity as has been described in the literature. Section-4 lays out the state of the art in the cluster policy advice available to a regional economic development practitioner. It focuses primary on cluster studies that make a case for policy interventions in support for economic clusters and the actual policy advice that is rendered in these studies and the large number of practitioner manuals that are available. Section-5 presents the emergent consensus on the substance and process of public policy intervention in support of creating economic clusters. Section-6 builds upon the discussion in the earlier sections and develops a new, albeit preliminary, vision of the public policy challenges as gleaned from both research and practice lens. Section-7 presents some tentative conclusions.

2– WHAT DO WE KNOW ABOUT ECONOMIC CLUSTERS? – A SYNTHESIS OF THEORY AND EMPIRICAL EVIDENCE

Before we go into the specifics of the debate on the role of public policy, especially activist policy interventions, in the creation and development of economic clusters, we would take stock of the theoretical foundations and empirical evidence on the various elements of the clustering debate. To start with, the theory of economic clustering or agglomeration is not a single unified and elegant theory of the phenomenon, as is generally the case in economics. Instead, the phenomenon of economic clustering and agglomeration draws heavily upon multiple theoretical traditions and disciplines as diverse as economics, geography, industrial organization, political science, and business and management. Each of these theoretical traditions view clusters in ways that are overlapping, yet sometimes quite fundamentally different from each other. To a lay person, these various theoretical traditions might appear somewhat converging primarily because they are talking about a phenomenon that exhibits itself in a somewhat coherent manner in the real life. However, it is argued that this sense of analytic convergence is only superficial in that for a trained eye the underlying principles and mechanisms of each of these theoretical traditions lead to dramatically different and often divergent conclusions.

2.1 – Five Theoretical Traditions in Economic Clustering

The theory of economic clustering and agglomeration draws broadly from five different traditions or schools of thought, namely, the neoclassical economics, the new growth theory, the economic geography, the business-management, and political economy traditions. We have reviewed these in some detail elsewhere (see Osama and Popper, 2005) and would only briefly introduce the key ideas here. Figure-1 summarizes the discussion.

The *neoclassical economics tradition* dates back to the seminal work of Alfred Marshall (Marshall, 1890) that ascribed factors such as specialization, labor-market, and technical externalities to the formation of economic clusters in the nineteenth century. For a long time, the neoclassical tradition led to a fruitful theoretical and empirical discourse and ably explained the number, size, and distribution of urban centers in the world's economic

landscape (Preer, 1992). Gradually, though, it fell out of favor because of its inability to explain—or better explain—certain characteristics of the economic clusters and agglomeration. In the 1990s, with the prevalence of high-technology clustering and the emergence of the Silicon Valley as the pre-eminent technology cluster, a new breed of economists in the *new growth theory tradition* stepped in to fill certain voids in the neoclassical view of clusters. The attention was turned away from traditional market-driven factors to the non-market phenomenon of knowledge or informational externalities. Knowledge, it is argued, enjoys increasing returns, is tacit, path-dependent, cumulative, and localized, and it is transmitted through face-to-face contact between people. Consequently, proximity matters, as geographically co-located firms and individuals are in the best position to learn from each other, and their customers, and innovate. Clusters grow to capitalize on these benefits of proximity.

Yet another loophole in the neoclassical view was the role of government and large actors in economic clustering. The *political economy view* of economic clusters brought additional realism to the debate. It hypothesized a significant role for large actors (influential-anchor firms, multi-national corporations) and the government in economic clustering. While it is unlikely that the political economy tradition could explain all clusters or even provide explanation for factors that could solely explain all clustering in a particular location, they do, however, provide good explanations for factors that fall through the cracks of the other theories. Michael Porter's *business-management tradition* emphasized on micro- (firm-level) factors of macro- (regional or national) economic competitiveness and clustering. Porter's famous Four Forces "Diamond" highlights the importance of firm strategy, structure, and rivalry; factor input conditions; demand conditions; and related and supporting industries as key influencers of the clustering process. It also acknowledges the role of government and chance events (i.e. history) in cluster formation and development. Though not unlike the business management tradition in substance, the *economic geography tradition* brings its distinct methodological style to the clustering debate. Economic geographers attempt to explain the spatial configuration of economic activity as an outcome of centripetal and centrifugal forces. Instead of focusing on elegant theories and models, they, through descriptive case studies, claim to be more "realistic" in that they pay greater emphasis on socio-economic and cultural contexts of the regions.

FIGURE-1: CONTRIBUTIONS OF FIVE MAJOR THEORETICAL TRADITIONS TO CLUSTER THEORY

	ECONOMIC GEOGRAPHY THEORIES (EGT)	NEO-CLASSICAL THEORY (NCT)	POLITICAL ECONOMY THEORIES (PET)	NEW GROWTH THEORY (NGT)	BUSINESS-ECONOMICS THEORIES (BET)
NOMENCLATURE	<i>Industrial District New Industrial Spaces Flexible production systems</i>	<i>Agglomeration</i>	<i>Industrial Complex Hub-and-Spoke Districts Satellite-Industrial Platforms</i>	<i>Knowledge Cluster Silicon-Valley look-alikes</i>	<i>Business Cluster Traded and Local Clusters</i>
SALIENT ATTRIBUTES	<i>Explain agglomeration in historical-local contexts through multiple factors</i>	<i>Supply-Demand Efficiencies (e.g. labor pooling etc. Reduced Transaction Costs</i>	<i>History Matters Political Interests e.g. MNCs, Large Firms, Govt.</i>	<i>Knowledge Spillovers Increasing Returns Knowledge Infrastructure</i>	<i>Firm Structure & Rivalry Supply & Demand Conditions, Related Industries</i>
KEY PROPONENTS	<i>Storper (1986, 1995) Scott (1988), Markusen (1996)</i>	<i>Alfred Marshall (1890) Weber (1929)</i>	<i>Massey (1994) Hymer (1960, 1976)</i>	<i>Romer (1986, 1990) Audretch (1990) etc.</i>	<i>Porter (1990, 1998, 2000)</i>
EMPIRICAL EVIDENCE	<i>Empirical, Case study Agglomeration of Industry Qualitative factors in agglomeration</i>	<i>Empirical. Co-location of production facilities is established.</i>	<i>Anecdotal-informal. Case studies suggest role of large firms and governments</i>	<i>Empirical. Localized knowledge spillovers are established.</i>	<i>Anecdotal-informal. Case studies document evidence on four-factor model.</i>
EXAMPLE - “POSTER CHILD”	<i>Silicon Valley Third Italy Hollywood, Orange County(CA)</i>	<i>Manchester (UK) Route 128 (Boston)</i>	<i>Flanders Valley (Belgium), Austin (Texas), Cyberjaya- MSC (Malaysia)</i>	<i>Silicon Valley (California)</i>	<i>California Wine Cluster Hollywood</i>
POLICY PRESCRIPTION		<i>Market forces bring about cluster formation. Intervene only to correct market failures. Discourage vertical integration, where possible.</i>	<i>Provide incentives to attract large “anchor” firms Special interests groups would dictate policy.</i>	<i>Invest in knowledge infrastructure (e.g. universities) and R&D. Correct “market failures”.</i>	<i>While Govt. and chance events influence, one can identify and upgrade (not create!) clusters through policy and strengthening of micro-macro framework.</i>

While each of these theoretical traditions provides answers to a part of the overall economic clustering puzzle, none of these solve the entire puzzle. They also might explain different kinds of clusters and/or different types of phenomenon within a particular cluster. The Silicon Valley, for example, is considered the prime example of a kind of cluster often promoted by the new growth theorists. North Carolina's Research Triangle and Austin – San Antonio corridor fit the mould of a political-economists' cluster and California's Wine cluster and San Diego are the better known examples of Porterian clusters. In this respect, these different theoretical traditions may be seen as complimentary rather than substitutes to each other. Having reviewed the various theoretical traditions, we would now turn to empirical evidence.

2.2 – A Synthesis of Empirical Evidence on Economic Clustering

The empirical literature on economic clustering and agglomeration dates as far back as half a century and continues to grow through this day. Several authors- have exhaustively reviewed this literature (Rosenfeld and Strange, 2003; Audtresch and Feldman, Osama and Popper, 2005 etc.) and thus, for paucity of space and otherwise, we would not attempt to do so here. What follows, therefore, is a brief synthesis that highlights some of the key findings on the subject and their practical implications for thinking about economic clustering and agglomeration in the context of this paper. More interested readers are requested to look at above cited sources for a more exhaustive overview of the empirical work in the area.

The empirical literature on clustering can be broadly classified into two categories. The first category deals with the validation of the phenomenon of clustering itself and the various forces and factors (e.g. spillovers, labor pooling etc.) that contribute to it. The second category deals with the benefits, in terms of economic outcomes (e.g. productivity, new firm formation, innovativeness, growth etc.), to firms locating in economic clusters and to the regions that house these clusters. We briefly review key insights in each of these literatures.

While there is unanimous consensus on the prevalence of economic clustering and agglomeration, there is considerable debate and controversy mars the precise nature and relative strength of the forces that cause it. For example, at one level, there is a debate on whether firms locating in clusters do so because they seek specialization or diversity of economic activity. Considerable work in this area has led to a lack of resolution with some

studies favoring specialization (or localization economies) while others finding diversity (or urbanization economies) to be more salient. There seems to be some consensus that one or the other types of forces may favor certain types of industries. However, the relative strength of these forces in a large number of industry sectors remains an empirical curiosity.

At another level, a related issue is the relative strengths of the exact mechanisms (e.g. labor pooling, forward and backward linkages, information and knowledge spillovers) and their contribution to the subsequent clustering of economic activity. Several authors have looked at each of these issues, separately, but have found it difficult to independently identify the effect of each within the same model. It is possible, in fact likely, that those finding evidence of one set of forces may be capturing the effect of others in their estimates. Of the attempts to look at these factors individually, the most recent and important contributions have been towards the study of information and knowledge spillovers. We seem to know a lot about the presence of knowledge and information spillovers and what we do not know from evidence we have inferred or hypothesized about.

That some kind of knowledge and informational spillovers exist is well established in literature. For example, investments in R&D seem to “spill-over” their immediate context and affect innovative outcomes of firms. Public sector funded R&D is found to have a positive influence on private-sector innovation but not vice versa. We have both direct and indirect evidence to suggest that distance (or proximity) matters in how much of this knowledge is spilled over. Not only do authors and patents get cited more often by those within the locale than those outside it but also firms within a region with certain innovation enhancing features benefit more from others within the region than from those outside the region. Similarly, proximity is found to be much more important for firms in one industry to learn from one in another industry than those within the same industry. These insights generated from several years of empirical research begin to create a better, albeit still incomplete, picture of at least one of the processes that lead to clustering of economic activity.

Our knowledge, however, is still deficient to allow us to make effective policies to support clustering. For example, while empiricists seem to find evidence of spillovers, the exact mechanism through which they are transmitted in space, time, and across sectors is still

relatively less studied and hotly debated. If the knowledge spillovers aren't really spillovers but are market-mediated transactions of some sort, as one set of studies argue, the policy prescription is likely to be significantly different from what it would be if they were spillovers instead. Similarly, our understanding of the type of industries that are more amenable to interventions focused on creating spillovers versus more traditional supply and demand factors is still in its relative infancy. Some theories have been advanced to suggest that industries' relative propensity to generate and benefit from spillovers vary with the state of their life-cycle and the knowledge content of their product or service etc. but the quality of advice in this area largely consists of a patchwork of theoretical propositions rather than a robust and comprehensive understanding of how spillovers are formed and transmitted across industry, space, and time. This lack of empirical evidence on key aspects of the clustering process seriously impairs our ability to render useful policy advice and make prescriptions.

On the second of the two empirical questions, a number of studies of old and newer vantage shed considerable light. Several economic geography studies in the 1970s and 1980s looked at the effect of city size on productivity of firms. They have found consistent evidence of enhanced productivity for larger cities. Estimates range from 14% to 2% increase in productivity for doubling of the city size, though there is a general agreement that the effect is around 3-8% (Rosenthal and Strange, 2003). Newer studies have looked at the effect of clustering on innovativeness of firms and have generally found some increase in innovativeness until a point after which congestion effects are presumed to set in. Others have hypothesized that while the presence of similar firms have a positive effect on innovation outcomes, the concentration of dissimilar firms (beyond a point) leads to congestion, thus implying that clustering is not enough to guarantee greater innovative potential of firms within a cluster, and that the composition of the cluster matters as well. Others have analyzed outcomes like wages, growth, and new firm formation, and have found results broadly consistent, but also somewhat different in their specificity, with the above findings.

To some up, while there is a fairly well-established and growing literature on economic clustering and agglomeration, it is somewhat scattered and inconclusive in its coverage of various important aspects of the phenomenon, especially the micro-foundations of the

clustering. If there is one overarching conclusion from this fairly extensive literature, it seems to be that details—of the types of industries and their life-cycles, the types of processes that lead to agglomeration, spatial properties and timescales of interactions etc.—do matter in the determination of the ultimate outcomes. The details, however, are often lost in statistical analyses of the kind most often found in the literature. While these issues are somewhat addressed in the more descriptive case study literature, there are serious limitations in using the latter as a basis for policy advice. To further complicate the picture, the empirical literature addresses policy only indirectly, and in the passing. While many authors have implied policy prescriptions from their empirical findings, they have been cautious in making that automatic connection (e.g. connecting the dots between existence of spillovers and policies geared towards promoting them). Also, important from a policy-analytic standpoint, the literature lacks an extensive and proper treatment of various methodological issues, not the least important of which are causality and cost-and-benefit analyses that are critical to better understanding of the policy levers available to decision-makers seeking to support economic clusters.

On the whole, while significant advances have been made recently in the theoretical and empirical realms, the literature falls short on important measures. From a theoretical standpoint on the one hand, it lacks a coherent and unified theory of clusters that incorporates all contingencies in a comprehensive manner. From an empirical standpoint on the other hand, it lacks enough finer details of causal factors and micro-determinants of the formation of various types of clusters that are critical for informing policy. These gaps in the theoretical and empirical foundations of economic clusters have had a significant influence on the formation and conduct of cluster policy.

3 – THE RATIONALE FOR PUBLIC POLICY INTERVENTION

The case for public policy interventions in cluster formation and development has been asserted vigorously in many ways. In its most important and purest form, a specific set of policies are hypothesized to directly influence cluster formation. These policies specifically deal with aspects of economic organization (e.g. agglomeration, cooperation and competition) that form the foundation of economic clusters. Alternatively, policy-makers

might fashion policies in a variety of different realms whose principal purpose might not be the formation of a cluster but that might, nonetheless, have a positive effect on the clustering process. Feser (1998) has introduced the terms cluster-specific policies and cluster-informed policies to differentiate between these two.

The influence of the cluster mindset on regional economic development planning and the subsequent demand for a policy prescription that supports cluster formation and development has been so immense that traditional industrial policy, science and technology policy, and regional economic development policy have sometimes been repackaged as cluster policy. One observer puts cluster policies at the intersection of the three above-cited realms of policy (Boekholt and Thuriaux, 1999). Clustering, notes another observer, “has become a central feature of microeconomic policy in the last decade, linking to industrial policies, regional policies, SME policies, DFI attraction, and research and innovation policies” (Stoerring, xxxx). Colovic-Lamotte and Tayanagi {undated} also add socio-cultural policy to the above mix, asserting the importance of the softer (social) elements of economic clusters. Nauwelaers (2001) echoes the sentiment as she highlights the importance of social capital in regions. The cluster policy, according to this view, embodies a shift in focus from infrastructure development to human capital and social capital development. Raines (2000) compares cluster policy to a “Trojan horse” due to its ability to package insights from different policy areas and bring them to bear on regional development.

To be fair, however, this penetration of cluster policies into other realms of public policy and vice versa may have happened for both good and bad reasons. Clusters do represent a confluence of various streams of economic development theory and practice (Rosenfeld, 2001,) but it has also become fashionable to re-label all that is worth doing under the much-in-demand cluster terminology. In the case of industrial policy, for instance, the cluster policy mindset, on the one hand, and industrial targeting, on the other, have tended to reinforce each other. While some have argued that the popularity of industry targeting stems from the concept of industry clusters (Hughes, 2005), the former’s popularity predates the latter’s recent appeal by at least several decades. Porter himself, has pointed out the innate differences between clustering and industrial policy-style targeting strategies. He argues that the policy prescriptions from his cluster theory are diametrically opposed to those from industrial targeting in that the latter emphasizes what industries or

sectors a country or region competes in while the former concerns how (productively) it competes in them (Porter, 1998). Porter also highlights that cluster policies focus primarily on the micro-determinants of regional and national economic prosperity while industrial policy does not.

Despite this attempt at clear differentiation, many see deeper messages in Porter's work that seem to imply industrial targeting of some sort (e.g. in his implicit preference for clusters producing traded goods over untraded and local clusters). Woodward (2004) contends that Porter's thinking on industrial targeting is muddled, at best, at least in its practical implications and ultimate usage, if not in its intent. The net effect, he and others argue, is that many regional and local governments, while enthusiastically embracing Porter's ideas, have resorted to targeting a small number of economic clusters considered significant to regional prosperity and have used public policy interventions to support these. Neither the practice nor the effect of doing so is qualitatively different from old-style industrial targeting.

Despite the aggressive policy agenda, however, the empirical record of cluster policies remains questionable. Cases where clusters were formed by pure government fiat have not always generated mature, innovative, and profitable clusters (Feldman and Francis, 2004, p. 129). However, despite this general consensus—that activist public policy interventions aimed at creating clusters often do not bear fruit (Martin and Sunley, 2003)—public policies aimed at influencing the formation and development of clusters remain pervasive. Several reasons have been advanced for this lack of evidence in support of cluster formation and development policy. Some have argued that we fail to find a clear evidence of policy-driven clusters because clusters take a long gestation time before they achieve substantial depth and size and hence prominence but also because cluster initiation is inherently unpredictable (Porter, 1998).

Wichkam (2004) identifies four causes for lack of effective implementation of cluster theory. First, much of the cluster policy work thus far has focused on descriptive information gathering rather than implementation and is based on shaky understanding of the underlying factors of economic clustering. Second, much of cluster policy has focused on replication of a small number of "success stories" without due regard to the unique

characteristics of target regions and/or structure and dynamics of clusters. Third, the practice of cluster policy has often been used as a means to allocate resources between targeted and other industries and across targeted industries rather than a way to build linkages and industrial synergies between them. Fourth, cluster interventions often suffer from policy confusion—with a large number of counterproductive policies in place—in the face of a lack of analytic clarity in the policy bundle.

Clusters emerge ‘naturally’ for good reasons or may infrequently be stimulated by making significant improvement in the regional economy. Many see the emergence of clusters as a market-induced process with little room for government interference (den Hertog et al., 1999). Porter himself reinforces this notion by asserting that “most clusters form independently of government and sometimes in spite of it”. There should be some seeds of a cluster that have passed a market test before cluster development efforts are justified (Porter, 2000, p. 26).

Others see arguments for government intervention in support for cluster formation and development. Porter, for example, acknowledges government as one of the influencers, alongside chance factors, in economic clustering (Porter, 1990). He identifies several possible avenues for government action. These include providing macroeconomic and political stability, improving microeconomic capacity of the economy by promoting efficiency and quality, and establishing overall microeconomic rules and incentives governing competition (e.g. competition policy, tax and legal system, intellectual property laws, corporate governance, and regulation.) Porter also describes possible “facilitatory” government actions for cluster development and upgrading (Porter, 1998). These actions include recognizing that a cluster exists and then removing obstacles, relaxing constraints, and eliminating in-efficiencies that impede the productivity and innovation in the cluster (Porter, 2000, p. 26). In his later writings (Porter, 2000, p. 26), however, Porter adds another (fifth) role to the government as developing and implementing “a positive, distinctive, long-term economic action program, or change process, that mobilizes government, business, institutions, and citizens”.

Porter cautions, however, against the tendency of governments to “pick winners” (Porter, 1998). Government, according to Porter’s view, should reinforce the development and

upgrading of all clusters, not choose among them. Ffowcs-Williams (2004), mirroring Porter's argument, argues that while clusters development must be driven by industry itself, government agencies have a "core partnership role to play" in the process of cluster development, particularly in providing legitimacy, facilitating coordination and collaboration, resource mobilization, and analysis.

Other schemes to resolve the issue of intervention in support for economic clusters have been proposed. Andersson et al. (2004) presents three rationales for policy intervention, namely, market-failures, government/policy failures, and systemic failures. Market failures occur when markets, uninterrupted by government, tend to under-invest in the production of certain necessary resources or activities (e.g. R&D, information, collaboration.) Government/policy failure provides an additional rationale for corrective intervention if the government, through a policy action or lack thereof, over-reacts in the first place. Systemic failures occur when there is a mismatch or inconsistency in the manner interrelated actors—individuals, firms, institutions, governments—participate in the economic sphere. They, however, do not develop the theme further.

Still others have attempted to embed clusters within the broader national innovation systems (NIS) literature by calling clusters, reduced scale NIS (den Hertog et al., 1999). The key characteristics of innovation systems that clusters seem to exhibit are the importance of interactions between different actors (interdependency) as well as institutions (systemic character). den Hertog et al. (1999) identify four rationale for public policy intervention, namely, creating a favorable framework for smooth functioning of markets, externalities associated with investments in R&D, the scale importance of government as a large player in several regional economies, and the need for removing systemic imperfections in innovation systems. Thus, in calling for policy interventions to remove systemic imperfections in innovation systems, the NIS approach takes a much broader view of government involvement than one supported by the market imperfection argument.

Looked at from another, slightly different though somewhat related, lens, national, regional and local governments may attempt to undertake policy interventions on several grounds that are not equally supportable, theoretically and empirically. These include, but are not

limited to, the market-failure argument, the competitiveness argument, and the equity argument (see figure-2). We briefly describe each of these below:

- *The 'Market-Failure' Argument* suggests need for policy actions when economic and market incentives are not enough to guarantee optimal allocation of resources and efforts by market participants alone. These might include the case for investment in basic R&D, common workforce development, addressing informational asymmetries, and provision of shared physical and technical infrastructure. Policy interventions in response to market failures are most strongly supported by empirical research both in terms of their validity and efficacy.

The 'Competitiveness' Argument promotes activist interventions to enhance the ability of locations or regions to compete with other regions, either domestically or internationally. Policy interventions based on competitiveness arguments attempt to promote or cultivate clusters by going beyond what is necessitated by a market failure. The relatively more prominent of the cluster policies (e.g. research parks, business incubators and public venture capital funds etc.) fall under this category. These policy interventions are undertaken in regions with some existing competitive advantages to upgrade regional competitiveness even at the cost of efficiency losses with a hope that gains incurred would more than compensate for the investment if policies are successful. The case for and against competitiveness-based interventions and their efficacy is hotly debated in the literature.

- *The 'Equity' Argument based policy interventions* find their legitimacy in the idea that it might be possible for lagging and disadvantaged regions (i.e. those with no existing competitive advantages) to break through their vicious cycle of under-development through a strategic use of public policy. These interventions are undertaken in areas

FIGURE-2: RATIONALES OF CLUSTER POLICIES : THE MARKET FAILURE, COMPETITIVENESS, & EQUITY LENSES

<i>Type of Problems & Arguments</i>	<i>Policy Instruments</i>	<i>Pros & Cons</i>
THE MARKET FAILURE ARGUMENT		
1. Inappropriability of R&D	- Basic R&D, university & public R&D institutes	- Long-term investments (generally) and must be a government priority, invention to innovation link is still tricky
2. Under-investment in common physical and technical infrastructure	- Telecom infrastructure, roads, airports, etc.	- Short-to-medium term, differentiation fast eroding among regions
3. Under-investment in worker training	- Invest in common education (e.g. community colleges etc.) - Support industry-funded training	- Medium-term, Difficult to justify solely as cluster policy - Short-term, low-cost
4. Coordination issues among local actors	- RDAs, networks, regional visions	- Policy of “picking winners” has questionable impact
5. Asymmetric information	- Promote market potential of regions	- Starts a zero-sum game b/w regions
THE COMPETITIVENESS ARGUMENT		
1. Knowledge centers / attractors are critical to cluster formation	- Upgrade university systems, - Establish S&T parks etc.	- Medium-to-long term, Require some existing capability - Med. term, not always cost-effective, cannot “seed” clusters
2. Attract and “convert” entrepreneurs	- VC funds, angel networks - Entrepreneurial training	- Environment/culture is critical, must accompany other policies - Short-to-medium term, low-cost but limited impact.
3. Start-up costs must be low enough to encourage new firm formation	- Create business incubators - Business friendly policies	- Difficult to set up and sustain, tend to attract “problem firms” - Easiest to set up, differentiation eroding among regions

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Towards A New Agenda for Cluster Theorists and Practitioners

<p>4. Firms locate to regions with infrastructure</p> <p>5. Once “triggered” clusters form through domino effect</p> <p>6. Quality of life is important decision variable</p>	<p>- Invest in infrastructure</p> <p>- Recruit “anchor” firms through incentives and market the region</p> <p>- Zoning, school systems etc.</p>	<p>- Medium-to-long term, costly, risk starting cluster where it isn’t</p> <p>- Short-term, leads to zero-sum game, often gets very costly very soon. Detailed cost-benefit analysis lacking.</p> <p>- Medium term, low-cost, Better done through public-private partnerships, needs other ingredients and policies to succeed</p>
<p>THE EQUITY ARGUMENT</p>		
<p>1. Lagging regions lack knowledge infrastructure</p> <p>2. Difficult to start a cluster from scratch in a lagging region</p> <p>3. Lagging regions attract less attention from prospective firms</p> <p>4. Difficult to attract expertise to lagging regions</p> <p>5. Lagging regions lack necessary conditions/infrastructure</p>	<p>- Invest in universities, R&D capacity</p> <p>- Focus on existing clusters</p> <p>- Market the differentiation</p> <p>- Attract expatriate/domiciled workers</p> <p>-Build infrastructure</p> <p>- Invest in innovative capacity</p>	<p>- Long-term, better focus on existing specialty of the region and build upon it.</p> <p>- A low-risk and viable strategy for short-to-medium term as capacity in gradually built in new areas in the long-run.</p> <p>- Difficult to compete head-to-head with competitive regions, must target differential advantage (e.g. quality of life, small well-knit communities, or areas with prior advantage)</p> <p>- Short-to-medium term, low-cost alternative to “borrow” a human resource base</p> <p>-</p> <p>- Medium-to-short term, requires some initial capacity</p>

with little or existing clusters. There is weak empirical support in literature for their validity and efficacy.

Organizing the various arguments into the figure-2 provides some insights into legitimate and not-so-legitimate reasons to employ cluster policy. For example, looking at figure-2, one can possibly infer that cluster policy interventions on the market failure argument are more likely to be of a structural rather than direct nature with government taking on the role of a facilitator rather than an active creator of economic clusters. They are also likely to be of a longer time horizon but are the most well-established theoretically and empirically not only as instruments of cluster policy but also of regional economic development policy in a more general sense. The competitiveness argument-based cluster policy interventions, in sharp contrast, are more activist in nature. They go far beyond the desire to rectify an actual or perceived market failure and hence may actually tamper with well-functioning markets. The evidence on such interventions is much less convincing than the more structural interventions and the literature suggests the need for exercising caution against distorting the market mechanisms that could possibly do more harm than good.

Policy interventions based on the equity argument find even weaker support. Many have argued that these investments are generally not designed to enhance marginal returns to the invested dollar and therefore might not pass a test of efficiency. Yamano and Ohkawara (2000), for example, look at Japanese public investment in 47 prefectures from 1970-1994 under Japan's 'harmonized regional growth' policy and conclude that had Japan pursued the policy of allocating resources efficiency, the level of national production would have been much greater than the current level. Frenkel (2000) makes similar conclusions about policies aimed at attracting high technology firms to peripheral regions. Preer (1992) describes this 'anarchic competition between regions' as analogous to the once-prevalent notion that "every region in the [former] Yugoslavia should have its own steel mill". The validity of public policy interventions on the basis of the equity argument or even their efficacy remains strongly debated in public policy circles. A detailed analysis of the arguments is beyond the scope of the current paper. What we can safely conclude here, however, is that the very weak evidence on equity-based policy interventions suggests a need for closer examination of such actions before choosing them as possible policy initiatives.

What is currently lacking is an intensive effort that builds upon the existing theory on public policy interventions in well- or poorly functioning markets, the evidence on the effectiveness of different kinds of policy instruments under varying circumstances and conditions, and a deeper understanding of the how public interventions motivated by the different kinds of arguments and rationales identified in figure-2 (above) have played out (the process) and delivered (the outcome) in reality.

4– WHERE RUBBER MEETS THE ROAD – A PRACTITIONERS’ PERSPECTIVE

Although the theory of economic clustering is fairly well-developed, albeit sometimes borrowed from multiple intellectual traditions, there is often a gap between the theory, empirics, and practice of economic clustering. Martin and Sunley (2003), for example, note that the rush to employ cluster ideas has run ahead of many conceptual, theoretical, and empirical issues. An entire cottage industry of policy analysts and consultants has sprung up to assist local, regional, and national governments in creating and upgrading clusters and their collective claims have often outstripped the empirical evidence available on the subject (Wolfe, 2003). The several practitioners’ manuals that exist (e.g. Solvell et al., 2003; Andersson et al., 2004; DTI, 2002; NGA, 2002 etc.) take a rather simplistic and mechanistic view of clustering that is often based more on popular stereotypes and anecdotal evidence than a comprehensive and theoretically sound treatment of the issue backed with authentic and verifiable evidence to support its conclusions. In fact, these two strands of work, the objective empirical research and prescriptive practitioners’ advice, have often worked at cross purpose, with the policy goals pre-determining the analysis rather than vice versa.

Under pressure from democratically elected politicians and regional leaders eager to be doing something for their regions, the practice of using policy to create and support clusters continues to forge ahead in spite of shortcomings due to unsubstantiated theories and serious gaps in empirical understanding. The practitioners’ perspective on economic clusters focuses on two distinct, yet interrelated, issues. The first is choice of methodology for identifying economic clusters in a region and justifying a focused cluster development strategy to support it. The second issue is the prescription for implementation (i.e. public

policies and private initiative) to execute the vision of the identified cluster. We will briefly review each of these.

4.1 – A Review of Cluster Analysis and Assessment Methods

The case for public or private initiative often begins with some analysis. Raines' (2000) stylized cluster policy-making process, for example, includes five stages: an economic audit, a policy audit, policy design and commitment, implementation of policy measures, and monitoring and evaluation. Cassidy et al. (2005) lists five stages of cluster development that include strategic decision-making, implementation, setting a baseline, evaluation, and renewal. In either case, some statistical or qualitative analysis must precede the call for implementation.

One of the earliest attempts to identify national clusters of US industries related through input-output (I/O) linkages were made in the early 1970s (Streit, 1969; Roepke et al. 1974; and Czamanski, 1974). Since then, a large number of quantitative-statistical and qualitative methodologies have been employed in regional cluster analyses. This burgeoning analytic enterprise is often driven by the conflicting concerns of ensuring that the analysis is as objective as possible while at the same time providing enough contextual richness to capture the uniqueness of each cluster and provide actionable insights—a concern for qualitative analysis. Lack of authentic local-level data on economic interactions is a major hindrance to quantitative analysis while substantial costs and concerns for generalizability and bias are major criticisms of the second. The key, therefore, is to strike balances between being objective but not too simplistic and qualitative while not being partial towards a particular cluster.

A plethora of cluster analysis and assessment approaches are to be found in hundreds of cluster studies and reports undertaken to date. These include, but are not limited to, general quantitative statistical audits (Pickernell et al., 2005), share-shift analysis (Porter et al., 2001; Buss, 1999), multi-sector qualitative analysis (WERU, 2002), “power indices” (DRI/McGraw-Hill, 1995), flow diagrams {SRI, xxxx}, location quotients (Austrian, 2000), SWOT analysis (Raines, 2001), benchmarking (Raines, 2000), input-output analysis (Feser and Bergman, 2000; WERU 2002), growth-share matrices (ICF, 2000), graph analysis (DeBresson and Hu, 1999), correspondence analyses such as factor analysis, principal component analysis, and

multidimensional scaling etc. (Vock, 1997; Roelandt and den Hertog, {xxxx}; Arvantis and Hollenstein, 1997; Spielkamp and Vopel, 1999), Delphi-type approaches and expert panels (Roberts and Stimson, 1998), participatory appraisal (Meyer-Stamer, 2003), and qualitative case studies (Porter, 1990 etc.). Larger multi-cluster studies have been able to employ multiple approaches to the same clusters (Wolfe, 2003).

No technique is without its critics. Those that on a snapshot of economic data at an instance in time are sometimes accused of missing out on the dynamic trajectory and a comprehensive life-cycle view of clusters in question (Breschi and Malerba, 2001). Porter's own work is highly qualitative and case-study depending thus capturing the contextual and institutional details of the clusters but largely lacks qualitative rigor. More recent efforts (e.g. Porter et al. 2001) supplement the qualitative analysis with some quantifiable data. They are a good first attempt but still fall far short. Porter's analytics also suffer from the tendency of attempting to impose a pre-set standardized framework (i.e. Porter's Four Forces Model) on every cluster. More intensive case studies of individual clusters that have supplemented contextual qualitative information with insightful quantitative data (e.g. studies of Silicon Valley, such as, Saxenian, 1994; Kenney, 2000; Chong-Moon Lee et al., 2000) tend to be the least controversial. They are, however, most resource intensive of all available approaches.

In addition to the shortcomings and failings of each of these individual methodologies, the cluster methodologies, as a whole, also suffer from serious deficiencies. First, regardless of the plethora of techniques available to identify clusters within a region's economy, much of what goes on inside a cluster (e.g. the evolutionary dynamics, the interactions between various actors etc.) remains a mystery to the analyst and the policy-maker alike. Second, despite a large number of techniques available, there is hardly a critical assessment of strengths or weaknesses of each or a comparative view of the range of insights that one may glean from applying several of these to a particular region. For example, what sort of differing insights do location quotients provide as compared to power indices (or input-output matrices vs. share-shift analysis), why and when to use one versus the other, and how can these be combined to provide a clearer and more comprehensive view of the clusters. Third, more often than not, these techniques are employed in a manner that is highly simplistic and mechanistic and has little or no relationship with the analysis or

policy recommendations. We take up the issue of the actual policy advice from the cluster assessment-analysis in some detail below.

4.2 – Policy Advice in Cluster Studies and Practitioners’ Manuals

One can review cluster policy (advice) from both an ex-ante and an ex-post as well as either a specific (contextual) or a general (context-neutral) perspective. The studies that take a more context-specific and ex-ante view of cluster policy are generally conducted to identify clusters in a region and build a case for intervention of some kind. The studies that offer generalized cluster policy advice, in an ex-post fashion, generally take the form of practitioners’ manuals or best practices guidelines. We briefly review each of these kinds in figures 3 & 4 respectively.

Figure-3 presents a snapshot of a selected group of five cluster studies. Each of the five studies, with minor exceptions, has a familiar pattern. The study begins by an overview of the regional economic environment, often using one of the several cluster methodologies identified in the sub-section 4.1 (above.) After having proven that what is being studied is really a cluster (or clusters,) it develops a rationale for public or private-sector intervention to support the cluster and concludes with a series of recommendations. Collectively, the studies reviewed employ a host of cluster methodologies, including, historical analysis, location-quotients, employment, innovation, and economic activity data.

While one of the studies, looking at creative industry clusters in Australia, laments the lack of appropriate data to analyze the industry at any level of detail (NOIE-DCITA, 2002), the majority of the studies that we looked at identified, in a very broad and general way, the contours of what could be a cluster of economic activity. They do not, for example, go as far as stating whether, and to what extent, the subject of their investigation actually exhibits some of the properties of an economic cluster in any one or more of the theoretical traditions, what type of cluster it is, what stage of development it is in, how might its construction deviate from the ideal case, how do the various actors in the cluster seem to interact with each other, and how might it be deficient in ways that could use public or private interactions. Many of these critical issues are merely hypothesized (i.e. do not directly show up in the analysis) and are implicitly assumed.

Collectively, the studies also present a broad selection of various types of arguments made to justify undertaking a policy intervention to support the cluster. The San Diego study, for example, does not explicitly make a case for public policy intervention. It implicitly works from the assumption that a cluster already exists and must therefore be supported (Porter et al., 2001). In the case of Ontario, on the other hand, the report uses a benchmarking analysis with other comparable regions in the US to suggest that Ontario, while being the leading cluster in Canada, lags considerably behind its counterparts in the US and hence must be strengthened through public policy intervention (ICAP, 2002).

Australia makes a somewhat similar argument when it states that Australian creative industries deserve public support because they comprise small players that cannot compete with larger players (often backed by their respective governments) that inhabit the global creative industry stage (NOIE-DCITA, 2002). Colorado seeks to create a biotechnology cluster to diversify its economy from its over-dependence on an already declining information technology cluster (COIT, 2003) and a multi-state nano-technology cluster in the South Western United States (SW-US) must be supported because the winners of the MEMS race are still largely undetermined and SW-US has a fair chance at outdoing its competitors in that.

What is evident even from this cursory overview is that, with the exception of the Australian creative industries study that alluded to a market-failure argument, each of these studies presents a variation of the competitiveness argument for policy intervention. The competitiveness argument, as discussed earlier, is controversial, to say the least. It is not clear if policy intervention of any sort could effectively steer the economic resources to their most effective usage within the economy and whether it would ultimately bear a net positive result in a cost-and-benefit calculation. In many instances, these regions are already evolving towards an economic profile that shows some signs of economic clustering and it is difficult to predict, *ex ante*, the effect of a policy intervention on this natural evolution. In fact, it is quite possible that tampering with this natural process might have a counterproductive effect on the cluster of interest or the broader regional economy. The literature does not seem to engage in any substantive way with these critical issues when making a case for and/or recommending a policy response.

The policy prescriptions in these cluster studies may be classified into three categories. One is a cautious approach (e.g. in the Ontario study) that acknowledges the lack of actionable information about the cluster and largely refrains from making any policy prescriptions. The other extreme recommends a list of policy interventions that are popularly prescribed in the literature (e.g. DeVol, 2002; COIT, 2003). In the middle is the Australian creative clusters study that, while suggesting the need for policies to rectify perceived market-failures, calls for more studies to determine appropriate policy interventions (NOIE-DCITA, 2002).

Figure-4 presents key findings of selected major cluster policy studies and practitioner manuals. The general flavor of these studies, with some minor exceptions, is that of providing a set of best practices for cluster practitioners to pick and choose from. DTI (2002) identifies a host of success factors (along with a rich sprinkling of relevant examples) associated with successful clusters. It classifies these into three categories of critical success factors, contributing success factors, and complementary success factors. The study, however, cautions against drawing any causal conclusions from its findings. NGA (2002) advocates for four broad categories of policy interventions: efficient delivery services to cluster members, targeted investment to clusters, within-cluster networking and learning, enhancements and improving the ability of a cluster's workforce. A large number of policy interventions could be placed within each of these broad categories and the report suggests some of them.

EDA (1997) identifies five imperatives for successful cluster efforts, namely, highly committed leadership, a strategy to ensure adequate resources, choosing the right geographic focus, finding tools to sustain momentum, and engaging potential implementing institutions early on in the process. Andersson et al. (2004) classify cluster-related policies into five broad categories, namely, brokering policies, demand-side policies, training policies, linkage promotion policies, and framework policies. Similarly, Stuart and Luger (2003) identify four main elements of successful cluster implementation strategies: organizing service delivery to address cluster businesses' needs, targeting investment to clusters, increasing clusters' networking and learning, and improving workforce readiness of the cluster. They also provide a comprehensive list of initiatives and programs undertaken by U.S. states under each of the four elements. Raines (2000) suggests that

cluster policy measures can be of three types, including community building (e.g. creation of forums, communication, branding etc.), linkages and projects (e.g. business-to-business, knowledge-research providers-to-users etc.), and common resources (e.g. information, infrastructure, and skills etc.)

Solvell et al. (2003) presents a statistical snapshot of the structure of over 200 cluster initiatives surveyed as a part of a Global Cluster Initiative Survey (GCIS). It identifies six broad objectives on which cluster initiatives focus their energies: cluster expansion, innovation and technology, research and networking, policy action, education and training, and commercial cooperation. It also identifies different types of policy interventions, programs, and initiatives—28 in all—that form sub-objectives to support each of these broader objectives.

While these represent merely a few of the countless practitioner manuals and sources of cluster policy advice that have proliferated in the last decades, they are representative of the general flavor of this literature. The field is marred by lack of causal evidence on policy measures that are freely and routinely prescribed under the rubric of cluster strategies. The predominance and popular acceptance of these measures “provides a false sense of comfort to researchers and economic planners who believe that if only they could emulate a set of best practices and institutions, they would be able to create successful clusters...truth cannot be far from this simplistic view” {Bergman, xxxx}. The recipe approach is challenged not only because every cluster is unique and hence demands an in-depth understanding of its own inner working and evolutionary dynamics, but also because many of these policy measures are not substantiated with enough empirical evidence (Andersson et al., 2004; Cassidy et al., 2005, Eisebith and Eisebith, 2004). These cluster policies/initiatives are thus not only poorly conceptualized and ill-developed to begin with (Held, 1996) but their lack of sound theoretical and empirical basis ultimately enhances the likelihood of ineffectual policy, wasted resources and even failure (Peters, 2004).

FIGURE-3: AN OVERVIEW OF PRACTITIONERS' ADVICE ON CLUSTERS – A SELECTION OF CLUSTER STUDIES

<i>Cluster Study/Citation/Conducted by</i>	<i>Analytic Tools, Data Used & Rationale for Clusters-Interventions</i>	<i>Implementation-Policy Prescriptions</i>
San Diego - Bioscience and Communications Cluster (Porter et al., 2001) By: Council on Competitiveness, Monitor Group, OntheFrontier	- Economic & Innovation Data Benchmarking, Cluster Participants Survey, Shift-share analysis - No specific "case" or "rationale" for cluster, except that clusters already exist and must be supported. (status-quo approach)	- Predominantly private-sector focused. Minimal policy advice. - Need to shift the emphasis from job creation to higher wages, from basic research to entire value-chain, from public/non-profit ownership to private ownership, and from regional institutions to cluster institutions.
Ontario, Canada – Multiple Clusters (ICAP, 2002) By: Inst. for Competitiveness & Prosperity	- Descriptive employment, production, and trade data, international comparison (w/ US) - Ontario ranks low (30 th w.r.t. US states) in productivity on a comparative basis.	- Primarily focuses on developing a profile of Ontario's clusters but stops short of analyzing, qualitatively, its structure and dynamics and making a policy prescription. Identifies questions that need to be resolved before any implementation can happen.
Australia - Creative Industries Cluster (NOIE-DCITA, 2002) By: National Office of Information Economy – Govt. of Australia	- Complains of limited, patchy, preliminary data - Digital content presents a potentially lucrative and disruptive opportunity. Australia's small-sized players cannot compete with publicly backed large players in the global market.	- Identifies several market failures, in size, skills, capital, information - Limited of current cluster dynamics suggests that initial focus must be on collaborative mechanisms & dissemination of business models - Detailed studies be commissioned on understanding the clusters - Beyond the scope of stage-1 study to prescribe specific policies
Colorado - Bioscience Cluster (COIT, 2003) By: Battele Memorial Institute	- Historical analysis, economic data, LQs etc. - Diversify its economy, provide high-paying jobs, contribute to growth in other sectors.	- Colorado must grow an already present bioscience capability by nurturing home-grown businesses, create research excellence, and encourage collaboration/cooperation. Policies include tax incentives, state-champions, industry associations, seed funds, marketing etc.
South Western (SW) United States - Microsystems Cluster (Devol, 2000) By: Milken Institute	- Economic Activity & Growth (Metro Comparisons), Location Quotients (LQs) etc. - Geographical "winner" of MEMS race are still undetermined. SW-US has a shot at the prize.	- Promote technology transfer and commercialization from research, invest state funds in venture capital, encourage angel networks, avoid competition between public spheres of influence, promote skill-development, incubators, strategize, communicate, monitor

FIGURE-4: THE STATE OF THE ART IN CLUSTER “ADVICE”: SALIENT FEATURES OF KEY PRACTITIONERS’ MANUALS

<i>Cluster Study</i>	<i>Salient Features of the Report</i>	<i>Key Policy Lessons / Conclusions</i>
A Practical Guide to Cluster Development (DTI, 2002)	<ul style="list-style-type: none"> - Subdivides cluster implementation into stages (Mobilization, diagnosis, collaborative strategy, Implementation, and Evaluation) - Rich anecdotes for each of the 15+ success factors 	<ul style="list-style-type: none"> - Identifies several factors, including 3 critical and 4 contributing success factors, and several complimentary factors, necessary for success. - Different policy-mix applicable at different life-cycle stages of clusters - Feedback through multi-attribute performance architecture is critical.
The Cluster Initiatives Greenbook (Solvell et al., 2003)	<ul style="list-style-type: none"> - Results of a Global Cluster Initiative Survey w/ over 250 clusters from around the world - Takes an institutional/organizational view of cluster “initiatives”. 	<ul style="list-style-type: none"> - > 80% clusters have fulfilled goals (self-described) while 4% have not - Government endorsement is important but should pick “member” firms - Explicit competitiveness frameworks, adequate budgetary allocations, and impartial facilitators seem to play a positive role.
A Governor’s Guide to Cluster-based Economic Development (NGA, 2002)	<ul style="list-style-type: none"> - “Clusters are bred, not constructed” - “Primer on clusters” designed to help integrate the concepts into economic development policy wisely and effectively. - Anecdotes of state clusters. Inventory of analytical tools/models 	<ul style="list-style-type: none"> - Advocates four types of policies, namely, those that more efficiently organize and deliver services (to clusters or multi-firm efforts), that target investments to clusters (e.g. in cluster R&D, S&T Parks, entrepreneurship, marketing etc.), that increase networking and learning (e.g. associations & alliances, external and intra-cluster channels etc.), and that improve cluster workforce (e.g. skills centers, alliances, and qualification systems etc.)
The Cluster Policies Whitebook (Andersson et al., 2004)	<ul style="list-style-type: none"> - Exhaustive background review that mixes a number of different fields e.g. clusters, NIS etc. - An Exhaustive review of policies—without a critical assessment of efficacy. 	<ul style="list-style-type: none"> - There are three rationales for policy interventions, namely, market failure, government/policy failure, and systemic failure. - There are five different categories of cluster policies, namely, broker, demand-side, training, linkage promotion, and framework policies
Planning for Clusters (DETR, 2000)	<ul style="list-style-type: none"> - Assess influence of planning systems on clusters - Focuses on six case study of clusters in UK 	<ul style="list-style-type: none"> - Planning systems have not hindered the growth of clusters, their effect is mildly supported, although the level of awareness among planners is low. - Regional planning should strongly support clusters, use best practices - Land use policy should be used to alleviate congestion/preserve amenity
Cluster-Based Economic Development: A Key to Regional Competitiveness (EDA, 1997)	<ul style="list-style-type: none"> - Provides multiple contexts-frameworks for cluster policy (e.g. narrow, disadvantaged, trading, opportunity, rural regions etc.) - Four stages: mobilization, diagnostic, strategy, implementation. 	<ul style="list-style-type: none"> - Identifies five imperatives for successful cluster-efforts, namely, highly committed leadership, a strategy to ensure adequate resources, choosing the right geographic focus, finding tools to sustain momentum, and engaging potential implementing institutions early on in the process.

Cluster policy advice derived from both cluster reports and practitioner manuals illustrates a gap between what is prescribed by cluster practitioners, consultants, and policy analysts—primarily in response to the growing demand for such advice—and the theoretical and empirical understanding of the subject that, although patchy, has continued to grow fairly rapidly during the 1990s. This gap between scholarship and practice manifests itself in prescriptions devoid of a solid empirical basis and primarily based on popular notions and stereotypes. Further, cluster policy advice in the majority of cases is highly generic and does not take into account the specific circumstances of the particular cluster in question.

One reason for this, clearly, is that policy advice can only be as specific and rich as the analysis and assessment of the cluster itself. Prescriptive statements can only reflect that reality. Another is that lacking even an accepted base of authentic empirical evidence on what works and what does not, those providing policy advice are forced to adopt a “kitchen sink” approach to making recommendations. Thus everything that seems to be associated with stereotypes of “successful” clusters is recommended regardless of the exact circumstances of the particular cluster in question. In the absence of a deeper understanding of the interactions between various actors and the dynamics of a particular cluster and how it might be facilitated through judicious use of evidence-based policy intervention, this generalized policy advice does serve the interests of cluster advisors, at least temporarily, as it shifts the onus of demonstrating success to the efforts expended in the implementation phase.

One example illustrates these points. One important policy element is collaboration between various actors in the economy. Hence, one of the more regularly provided pieces of advice for regional economic and business leaders is to create specific cluster institutions tasked to promote collaboration among regional actors (commonly referred to as “institutions for collaboration” or IFCs). This is generally based on the notion—made popular by the folklore on informal networks in the Silicon Valley (e.g. Saxenian, 1994)—that knowledge spillovers can best be captured through frequent interactions between people in a cluster. Institutions that would encourage such interactions are likely to

contribute positively towards the growth of clusters. There is, however, no authentic and empirically sound study to support such a conclusion.

In fact, many even question the notion of knowledge spillovers as the key driving force behind intra-cluster exchange of information. Others have presented a bleak view of collaboration within clusters. Zucker et al. (1999), for example, have hypothesized that knowledge transfer within clusters occurs through market-mediated transactions rather than informal exchanges of the kind hypothesized in the popular folklore of clusters. If their analysis is correct, IFCs may be of less value than supposed in promoting the kinds of interactions deemed beneficial for the growth of clusters. Yet, study after study recommends that IFCs be created to jumpstart the clustering process. The same may be said of S&T parks, incubators, entrepreneurial forums, industry associations, and investments in university systems, all popularly prescribed interventions whose direct and immediate effects on economic clustering are unsubstantiated.

5 – TOWARDS AN EMERGENT CONSENSUS ON CLUSTER IMPLEMENTATION

While important issues remain unresolved on the substance and the specifics of cluster policies, one can detect what may prove an emergent consensus on the broad features of what cluster policy means to regional economic development planning and how might it be effectively implemented. Many of the more substantive and thoughtful contributions in this regard have come from Europe. The new unified Europe—with its extensive requirements of economic convergence and policy coordination—has recently been a hotbed of innovation in regional economic policy. It is within the rich and diverse European context that researchers have begun to answer some of the more philosophical questions about cluster policies: What is the appropriate level at which cluster policy must be executed? What are the most appropriate organizational-institutional forms to implement cluster policy? How might the cluster initiative be structured and how should it integrate with and influence the rest of the regional economic policy regime in place?

Raines (2001), for example, examines whether cluster ideas have resulted in new definitions of regional competitiveness within different policy-making traditions; whether they have

generated new types of policy measures in support of regional development or merely reclassified already existing measures; and whether the concept has led to new systems of policy delivery. Studying cluster policies in seven European countries as a part of the Euro-Cluster Project at European Policies Research Center (EPRC), he found that the cluster notion has often been complimentary rather than a substitute for other development paradigms. Largely serving as add-ons to existing policies, cluster policy-making did not result in any novel policy measures per se, although those adopted might be additional to what would have been without the cluster framework in place. Further, cluster policies tended to reinforce the already existing trend towards more localized delivery and generally (with minor exceptions, where some adhoc structures were created) tended to use already existing institutional infrastructure to support policy delivery.

If a consensus has begun to emerge on the value and efficacy of using the cluster framework in regional economic development planning, it would be to view the cluster framework as a different way of looking at the region's economy rather than a dramatic change in the substance of policies per se. Porter himself regards cluster analysis as a "distinct way of organizing economic data and viewing the economy" that provides a new way of thinking about the economy, organizing economic development efforts, and channeling investment by public and private sectors (Porter, 1998). Nauwelaers (2003) notes that originally, the cluster concept was a tool for analyzing industrial structure rather than directing policy. Many still view cluster policy not as a new policy approach but as a combination of instruments from traditional policy fields. Waits (2000) notes that clusters have been used as an analytical tool, as an organizational tool, and as a service delivery tool. Rosenfeld (2001) seems to agree with the notion as he notes that cluster policy has not only an outcome (i.e. number of firms agglomerated in a region) but also a process dimension (i.e. understanding the economy and developing strategies to enhance the competitiveness) that is as critical as the former.

In addition to providing a different way of looking at regional economic data, applying the cluster framework has also led to a gradual shift in the locus of policy-making itself from the national level to local and decentralized policy planning and action. This transition has not been automatic. Raines (2000) surveys cluster policies in several European countries, for example, and notes that the locus of policy-making has varied considerably with cluster

policies being employed at different levels of the government. He identifies, with examples, at least four different types and levels of cluster policy making prevalent in Europe. He terms these national advantage policy (e.g. in Denmark and the Netherlands), centralized cluster policy (e.g. in France and Norway), decentralized cluster policy (e.g. in Italy and Austria), and mixed or interactive cluster policies (e.g. in Sweden and the U.K.). The trend towards greater decentralization and localization, however, is unmistakable. Many European countries, over the years, have witnessed a transfer of policy design responsibilities to lower levels of governance resulting in a more bottom-up approach to economic development (Downes and Raines, 2003).

Taylor and Raines (2001) go a step further to assert that one of the chief benefits of cluster policy has been that it has “fashioned communities of policy interest”. They found, in the studies of Scottish and Swiss clusters that outcomes include not only the development of the regional economy, but also development of the public sector’s ability to understand regional economic challenges and act at a localized level. In many instances, regions have used the cluster initiative to jumpstart a constructive dialogue between the business community and the national, regional, and local governments. The process involves creating awareness of the cluster within the regional communities, forging new mental maps of the region’s industrial structure, developing a sense of ownership among various stakeholders, developing a future vision and an agenda of action, and fashioning public-private partnerships to support various components of that agenda. This not only brings critical knowledge and appreciation of the region’s socio-economic environment—something that top-level policy-makers often lack {Colovic-Lamotte and Tayanagi, xxxx}—but also brings the policy-making imperative to the level of governance most well-positioned to act upon that knowledge and insight. In doing so, cluster policy has become a means for resolving—rather than exacerbating—existing tensions between different policy areas and governance structures (Raines, 2000).

The questions of what types of cluster policies (top-down or bottom-up) and institutional forms that must accompany them tend to do better have only now begun to be asked (Eisebith and Eisebith, 2004). The field is in need of a comprehensive effort at formal theory-building that provides the relevant insights in designing implementation initiatives,

institutions, and action plans. We now address two of the several facets of a prospective cluster implementation theory, namely, implementation scenarios and institutional forms.

5.1 – Alternative Cluster Implementation Scenarios

Cluster initiatives can range from extensive and well-integrated, on the one hand, to intensive and limited, on the other. The choice of a particular implementation scenario depends, among other things, upon the aims and objectives of the cluster plan, the mission of the agency charged with implementing it, the initial conditions or the degree of preparation of the cluster itself, the public sector philosophy of the country-region in question, and the degree of acceptance and ownership from the private sector.

With the type/philosophy of public policy involvement on one axis (e.g. top-down or bottom-up) and the scope/depth of implementation on the other (e.g. extensive-integrated, strategic-adaptive, intensive-

limited), we have an entire space of possible implementation scenarios that could become guides for a cluster policy implementation. We discuss three such alternatives below for illustrative purposes.

Implementation Scenario-I: Extensive-Integrated, Top-Down Cluster Initiative—

The extensive-integrated scenario entails a typical top-down approach to cluster development. Under this scenario the idea of the

BOX 1: EXTENSIVE TOP-DOWN CLUSTER STRATEGY IMPLEMENTATION IN SCOTLAND

Scottish Enterprise was charged with creating 7 clusters in 1999-2000. The expenditure on seven 5-year plans was estimated at 360 million Euros. Monitor Inc. was engaged to do a preliminary study that identified 30 potential clusters in Scotland. The cluster choice was made in a top-down manner with little private sector input and with each cluster choice having a different rationale. Cluster strategies and action plans have been developed by seven individual cluster teams. These action plans are complex documents with large number of policy measures—e.g. the semiconductor action plan contains 90 difference measures—yet they also have brought together and relied upon a number of already existing plans and actions. This produces an integrated approach that minimizes the time-span and scale of policy interventions. Implementation is overseen by special plan delivery groups comprising public-private entities and have encouraged voluntary private sector involvement. Programs are time-limited and Scottish Enterprise (and the government) seeks to exit the field after making the clusters self-sustaining.

cluster is often conceived and the decision to launch a cluster initiative is made within the public sector. In the extensive-integrated model, the regional/local government makes the cluster policy the centerpiece of its regional economic policy by embedding the cluster philosophy in a variety of public policy processes and institutions. These could include land-use, manpower development, investments in R&D, development of research capacity, marketing and branding, and other aspects of industrial, development, and technology policy.

Despite the highly visible and active role adopted by public sector entities, the cluster initiative also depends upon the involvement of and acceptance by private sector entities, firms and networking institutions (such as industry associations.) The implementation begins with the development of an integrated economic and regional policy regime across various government agencies that coordinates various policies, identifies and fills gaps, and creates an environment for collaboration and competitiveness in the private sector. Significant public sector investment is also made to enhance or generate regional innovation capacity by setting up and seeding universities, training institutes, research institutions, and even industry.

This implementation scenario requires investment of significant political capital to guide and coordinate all aspects of economic policy-making. It also requires considerable upfront commitment of resources toward a specific economic development philosophy that might foreclose alternate options to pursue economic development objectives. Exercising this option could be risky if a region's economic reality differs considerably from the perception of its cluster champions. On the other hand, adopting an extensive and integrated approach to cluster strategy implementation, when the necessary political and economic ingredients are aligned, provides the right focus, thrust, and level of investment needed to capitalize on a window of opportunity.

Implementation Scenario-II: Limited-Targeted, Bottom-Up Cluster Initiative—The limited-targeted cluster initiative takes a less aggressive approach towards cluster policy. A limited and targeted approach to cluster initiative may be employed under a variety of different scenarios. For example, the starting point for an effort might rest on the assumption and understanding that a cluster already exists and does not require a heavy

dose of policy interventions to ensure a desirable pattern of evolution. The cluster initiative thus employed may merely aim to make targeted interventions in areas where certain weaknesses may be perceived rather than employing the entire economic development policy making machinery of the state or region in question.

Alternatively, a different scenario for limited-targeted approach to cluster initiatives may be conceived whereby a cluster is in its infancy—i.e. is not yet ready to take off— and is perceived that it would not

benefit from aggressive policy interventions. Under this scenario as well, preference may be given to a more limited bottom-up approach where government encourages cooperative linkages among firms and other institutions and supports investments to enhance cluster competitiveness as and when a nascent cluster becomes visible. In the limited-targeted approach scenarios, the public sector generally assumes a facilitative role in cluster development and seek to ensure that the environment and conditions necessary for the private sector to assume leadership of the cluster initiative are put in place.

In this scenario, the government's commitment to the creation and upgrading of economic clusters could take two distinct forms. The public sector could invest aggressively in building the infrastructure for economic competitiveness generally, with a view towards clustering but without regards to particular clusters. This would include investments in human resource development, ICT infrastructure, lowering the costs of doing business, and branding the region and its businesses.

BOX 2: PUBLIC-SECTOR FACILITATED CLUSTER STRATEGY IN THE BASQUE COUNTRY, SPAIN

Basque Country (Spain) commissioned a study in 1990. Ten clusters were formed between 1991-2000. The cluster policy can be divided into two phases, the Basque Competitiveness Plan (1991-95) and the Basque Industrial Policy (1996-99). The first shaped strategies and structures, changed perceptions, and set the stage for consolidation. Government set a standard methodology for groups to take the cluster idea forward but potential clusters were left to decide whether to opt-in or not. Where potential partners were unwilling, however, a cluster was not formed. Cluster working groups, supported by consultant facilitators, developed strategic plans, action plans, and monitoring indicators. These, after negotiations, became contractual agreements between government and clusters. Government directly funded cluster associations at a modest 2 million euros/yr. as well as subsidized other activities (up to 70%) from economic development budgets. Although working under a common framework, each cluster implements its own unique strategy. Each cluster association sends a six-monthly activity-expenditure report to each of its members and the government.

In addition, the public sector could seed modestly financed cluster initiatives aimed at popularizing awareness of the cluster among firms within various nascent clusters and creating a number of institutions for collaboration (IFCs) that could sustain and accelerate cluster dynamics among such firms. These IFCs might include regional development agencies, cluster associations, entrepreneurship forums, and university-industry linkage platforms. The key benefit of adopting this more limited, yet targeted, approach is to allow for a more bottom-up development of regional economic clusters while at the same time limiting the overall exposure and diversifying the investments of the public sector.

A major challenge for adopting a limited and targeted implementation scenario is guarding against over-dilution and trivialization of effort. There is always a possibility that despite the government's effort to inculcate a cluster identity and facilitate cluster formation, private sector entities may not choose more substantive engagement and sustainable cluster institutions may not develop. Nascent clusters might also need more substantive investment than the private sector is likely to provide (especially in infrastructure and human resource areas.) More direct government involvement might be required. Failing to meet this need might result in too-long development periods and even loss of legitimacy and dashed hopes for cluster champions and members. On the other hand, this approach provides governments with an option to engage private sector entities in planning and thinking strategically about enhancing their economic and export competitiveness while deferring more substantive and aggressive engagement until necessary infrastructure is in place and political will has been mobilized. The private sector-led, participatory strategy-making and implementation process provides a window for the government to learn about the competitive dynamics and potential of various clusters. It also buys critical time needed for other, longer-term, infrastructure investments to take effect and deliver results.

Implementation Scenario-III: Strategic-Adaptive Partnership-based Cluster Initiative—

The third scenario falls between the first two. It's guiding principle is to identify and leverage opportunities for strategic government support to economic clustering without forcing a particular outcome.

It, however, requires a certain set of initial conditions to be effective. It might be considered, for example, under the scenario where the cluster assessment process has uncovered several significant gaps in the socio-economic and policy environment. The government may then choose to adopt an implementation strategy that calls for the public sector to make strategic use of its ability to trigger economic clustering and/or enhance the competitiveness of existing clusters by a) investing in infrastructure and human resources development, b) empowering private sector

BOX 3: STRATEGICALLY PLANNED ENGAGEMENT IN CANADIAN CLUSTER STRATEGY, CANADA

In 2000, the Canadian government committed C\$110 million to build 10 internationally competitive innovation clusters by 2010. In 2001, an additional C\$230 million were allocated for the purpose. The money was routed through the National Research Council (NRC) of Canada. NRC's approach to cluster development is to invest heavily, but strategically, into R&D capacity, human resources capacity, development of community networks, and scientific and technological information. In each of the 10 identified clusters, NRC has funded community initiatives, roundtables, assessments, and action plans, as well as made substantial investments in research capacity and human resources. Each of these locations has been funded at a substantial (~ C\$20-30 million, on average) level. A major part of the funding has gone towards the establishment of 19 research centers spread across these locations. A number of industry partnership facilities (IPFs) have also been created to support the creation of entrepreneurial firms. While the Canadian Cluster Initiative is large, it is strategically planned to suit the initial conditions and bridge gaps in the existing innovation infrastructure in Canada. It also is not well-integrated across all government planning agencies and is only a small part of the overall economic development strategy of the Government of Canada.

entities to cooperate and create internationally competitive businesses, and c) being opportunistic in identifying and acting upon possibilities to support economic clustering. This could be done by leveraging government finances with private sector investment, for example, in the creation of new venture capital funds, etc.

There are several advantages and disadvantages of adopting this approach. On the positive side, this approach holds promise as it allows both private and public sectors to gradually build support and capability for executing the cluster strategy without excessive prior commitment. It also provides the flexibility required to monitor investments and

investment opportunities continuously and re-configure the investment or engagement strategy as the cluster evolves. This flexibility can be of great value in a rapidly changing external environment. The challenges of executing this implementation approach are to achieve sufficient organizational and policy flexibility, the ability to identify investment opportunities that make the most sense, and to build a continuing relationship of trust as the basis for an effective, if informal, public-private partnership between government and business leaders. The latter is best achieved by encouraging continuous communication between various stakeholders facilitated by a neutral and respected third party. On the negative side, however, under the strategic-adaptive approach, cluster formation might take too long and run the risk of losing on a window of opportunity, should one present itself. Sustained levels of public-private partnership might be difficult to maintain over a long duration of time and public-sector alone may not be in the best of the positions to identify and execute on fruitful investment opportunities (i.e. pick “winners”).

These are merely three of the several possible implementation approaches and scenarios. Figure-5 (below) presents the salient features of each. The final choice of a particular course must depend upon initial conditions and several other factors germane to the region’s economic and political realities. Also, the discussion of possible implementation approaches is only beginning to take place now. There is considerable room for improving our understanding of the various pre-requisites, advantages, disadvantages, and complicating factors that must be considered while undertaking any one of these implementation approaches. Considerable theory building—through qualitative and/or quantitative approaches—must precede the ultimate choice of a particular implementation approach for each cluster opportunity.

FIGURE-5: SALIENT FEATURES OF ALTERNATIVE IMPLEMENTATION SCENARIOS

	1. EXTENSIVE - INTEGRATED	2. LIMITED – TARGETED	3. STRATEGIC-ADAPTIVE
<i>Cluster Leadership</i>	<i>Government</i>	<i>Private Sector</i>	<i>Shared</i>
<i>Ownership</i>	<i>Multiple Govt. Agencies</i>	<i>Single Govt. Agency</i>	<i>Shared</i>
<i>Time Frame to Maturity*</i>	<i>5-7 years</i>	<i>10-15 years</i>	<i>7-10 years</i>
<i>Implementation Philosophy</i>	<i>Top-Down</i>	<i>Bottom-up</i>	<i>Iterative, Opportunistic</i>
<i>Analytic Requirements</i>	<i>Medium (upfront)</i>	<i>Low (upfront)</i>	<i>Medium-High (on-going)</i>

Towards A New Agenda for Cluster Theorists and Practitioners

<i>Consulting Fees*</i>	<i>Medium</i>	<i>Low</i>	<i>Medium</i>
<i>Investment/Projects Costs*</i>	<i>High (\$hundreds million)</i>	<i>Low (\$ millions)</i>	<i>Medium (\$ tens million)</i>
<i>Contractual Complexity</i>	<i>Medium to High</i>	<i>Low</i>	<i>High</i>
<i>Key Pros</i>	<i>Focus, Thrust, Resources</i>	<i>Options, Buys time</i>	<i>Leveraging, Flexibility</i>
<i>Key Cons</i>	<i>High stakes, Closes options</i>	<i>Sustenance, Speed</i>	<i>Trust building, Flexibility</i>
<i>Public Sector Role</i>	<i>Leads, Invests heavily</i>	<i>Facilitates (hands off)</i>	<i>Invests Opportunistically</i>
<i>Private Sector Role</i>	<i>Follows govt. vision</i>	<i>Leads w/ govt. support</i>	<i>Public-Private Partnership</i>
* Approximate (suggestive) figures based on experience of, and literature on, similar efforts			

5.2 –Institutional Forms for Implementation

More often than not, cluster initiatives are launched without paying due attention to the choice of appropriate institutional form or resource requirements needed to bring the initiative to fruition. Each of the three implementation scenarios (described above) may be implemented through a variety of institutional vehicles. Each institutional vehicle is different in terms of its pre-requisites (e.g. initial conditions), resource requirements (e.g. costs, duration), and expected results. The choice of the appropriate institutional form is also often dictated by the objectives of the cluster policy (e.g. pursuing a single cluster vs. multiple clusters), the information processing capability and the degree of involvement of the coordinating agency (e.g. a regional development authority or a private-sector cluster organization). The institutional forms for cluster implementation may be composed of several elements, some mutually exclusive and some complimentary: an individual point of contact at a regional development agency or economic development office who acts as a cluster champion; an entire agency dedicated to implementing a cluster initiative; a single private-sector entity contracted by a government agency to act as an analytic and implementation intermediary; a consortium of multiple implementers working across multiple clusters. For the purpose of illustration, we briefly discuss three standard institutional forms for implementing a multi-cluster initiative.

Single Implementation Integrator (SII)—Under this institutional form, a single integrator, acting on behalf of the public-sector planning and implementation agency, coordinates the implementation activities across multiple clusters. This institutional form reduces the coordination burden and contractual complexity for the government agency and transfers

the onus of delivering performance to the selected implementing entity. It also provides greater flexibility and stronger incentive to this entity to deliver results. The major disadvantage is significantly reduced control over implementation beyond the award of contract. In the case of below-par or unsatisfactory performance, the planning agency may find it difficult to take drastic measures. Another concern is that it is unlikely that one single organizational entity would bring domain expertise in multiple cluster target areas. The planning agency would thus need to rely on the discretion of the implementation integrator in bringing in the right domain expertise.

Multiple Implementation Integrators (MII)—Under this institutional form, the planning agency writes separate implementation contracts for each of the targeted clusters. This institutional form has the advantage of ensuring that the planning agency is able to enlist implementers with specific domain knowledge and professional networks. It also provides the planning agency with greater control of the overall cluster initiative. In addition, this institutional form provides greater flexibility in implementing differentiated cluster strategies for each of the targeted clusters. The most important disadvantage, however, is the additional analytical and coordination burden on the planning agency should it opt to act as the integrator-of-integrators itself. Alternatively, the planning agency might decide to hire the services of an implementation integrator who then oversees a number of implementation contracts on its behalf. This option is potentially costlier (at least marginally) than the single implementation integrator option because of the additional coordination cost and the duplication of certain cost components.

Projects-based Implementation (PBI) – Under this institutional form, the planning agency itself acts as the implementation integrator (not the implementer, however) and awards multiple implementation contracts on a project-by-project basis, as and when required by the cluster strategy and implementation action plan. This option may also require the planning agency to seek additional domain expertise through a series of limited consulting contracts to cover the wide range of targeted clusters. The key benefit of using this option is the additional flexibility and control that it provides. In the event of changing socio-economic trends and success or failure of certain aspects of the strategy, the projects-based implementation scenario provides the planning agency with a much greater ability to re-configure or pace the initiative accordingly. It will also allow the planning agency to better

learn and adapt from the lessons learned during the implementation effort itself. Finally, it would allow the planning agency to directly vet every implementation entity individually. The drawbacks of selecting this institutional form are the extensive analytic requirements to assess, on an ongoing basis, the progress of implementation of the cluster strategy, but also adapt and identify avenues for strategic intervention.

The interaction between implementation scenario and institutional form is summarized in Figure-6. The 3x3 matrix illustrates the strengths and weaknesses of each combination. While there may not be a single ideal path for implementing a cluster initiative, as each of the nine cells (or combinations) has its own merits and demerits, it is important to think about and attempt to address the issues identified in these cells. Doing so would allow construction of hybrids that might accentuate the strengths and minimize the weaknesses of the approaches that they draw from.

The exact choice of the implementation scenario and institutional form would determine, among other things, the ultimate costs and duration of the cluster initiative. Costs of implementing a cluster strategy is another one of the several under-studied elements of what should be a cluster (implementation) theory. The task of estimating even average costs is made more difficult by the uniqueness of each cluster and the strategy being executed. Cluster implementation costs generally comprise consulting (or process) costs and investment (or projects) costs. In smaller, limited, cluster initiatives or process costs might constitute a major portion of the cluster initiative. These initiatives generally focus on creating awareness and an identity within a targeted cluster by conducting analytic studies and creating institutions for collaboration. The investment decisions of private-sector entities then create the cluster in a bottom-up fashion.

FIGURE-6: THE INTERACTION OF IMPLEMENTATION SCENARIOS AND INSTITUTIONAL FORMS

IMPLEMENTATION SCENARIOS & INSTITUTIONAL FORMS	1—EXTENSIVE – INTEGRATED <i>The Cluster Initiative becomes the backbone of economic development and industrial strategy and policy.</i>	2—STRATEGIC - ADAPTIVE <i>While creating the infrastructure for innovation and cooperation, Govt. makes strategic-opportunistic investments</i>	3—LIMITED – TARGETED <i>The cluster initiative is undertaken in addition to other ongoing initiatives in the larger industrial and economic development strategy.</i>
A—Single Implementation Integrator <i>A single integrator serves as the focal point for all implementation efforts across various government and private sector entities.</i>	Pros: 1. Single integrator serves as ideal for a multi-agency integration effort. Cons: 1. Scale and scope of implementation may be too broad for one single entity to handle	Pros: 1.. Better “forest rather than trees” view 2. Reduced cost to achieve multi-sectoral coordinated action. Cons: 1. Loss of control, and lack of flexibility after award of implementation contract	Pros: 1. Task simple enough to be handled by single integrator 2. Reduce costs through pooling expenses Cons: 1. Enhances the risk by committing to a single implementation philosophy
B—Separate Implementation-Integrators <i>A number of implementation entities—at least one each for four clusters—concurrently work together on separate contracts with the planning agency either acts as the integrator-of-integrators or hires one.</i>	Pros: 1. Multiple implementers bring required domain expertise to the table 2. Differential implementation strategies Cons: 1. Difficult to integrate the overall effort 2. Possibilities of rivalry between multiple integrators	Pros: 1. Provides breadth of domain expertise to make different implementation strategies Cons: 1. Not enough (or lesser) control over the implementation effort 1. Stove-piping and limiting the “forests rather than trees” view	Pros: 1. Separate integrators align well with bottom-up approach to implementation 2. Ability to pursue differentiated strategies for each targeted cluster Cons: 1. Costs might be too high for an initiative of limited scope/size
C—Project-based Implementation <i>The planning agency adaptively implements the cluster vision by bringing in relevant expertise (including domain expertise) on a project-by-project basis.</i>	Pros: 1. OCIPED maintains control & visibility 2. Best access to functional expertise Cons: 1. Still requires extensive domain expertise (to be sub-contracted)	Pros: 1. Provides flexibility and adaptiveness for making strategic investments 2. Provides depth of analytic ability Cons: 1. Possibilities of stalling due to bureaucratic “over-control”	Pros: 1. Easily scalable if conditions are right 2. Least cost option for a limited scope initiative Cons: 1. Possibilities of stalling the process due to bureaucratic “over-control” 2. Not enough private sector ownership

In more extensive-integrated clusters, on the other hand, investment costs far overshadow the process costs. This is especially the case if extensive upgrading of human resources and R&D infrastructure is required to make the cluster competitive. Strategic-Adaptive scenarios fall somewhere in between these two extremes. Here, the key objective is to identify investment opportunities that leverage public sector money with private-sector investment thus providing a better return on public investment.

A comprehensive approach to cluster implementation must address issues of implementation costs, durations, risk factors, and contingencies and possibilities of costs-schedule overruns for the various combinations of implementation scenarios and institutional forms. While each cluster is unique and must be planned accordingly, sharing of cost data on best and worst case scenarios, best practices, do's and don'ts, and generic principles could be instrumental in helping the cluster practitioners in devise strategies and implementation plans that have a better chance of success. This could also be a starting point of a more formal theory of cluster implementation that could be used for prescriptive and predictive purposes.

6 – LINKING RESEARCH WITH IMPLEMENTATION – A NEW AGENDA FOR CLUSTER THEORISTS AND PRACTITIONERS

The literature on economic clusters and practice of cluster policy is clearly a fast moving target, rapidly evolving yet far from being comprehensive. Future development and refinements to applying this policy that could enhance and demonstrate utility for regional leaders and economic development planners will determine whether it makes lasting contributions to the conduct of regional economic and development policy. While the proponents of cluster thinking point to the several contributions it has already made to the theory and practice of regional economic development (providing a new way of looking at the regional economy, shifting the focus of policy from industrial targeting to enhancing the competitiveness of all the regions' industries, providing micro- (firm-level) foundations to macroeconomic policy, providing a distinct focus and a practical orientation, providing a

framework for structuring new public-private partnerships within the regions, and introducing the idea that several determinants of firm-level success tend to lie outside the firm,)), its critics point to the many lingering questions about specificity and utility.

There are at least two factors that fuel much of the criticism against cluster thinking and cluster policies. First, more often than not, cluster policies tend to have a faddish rather than substantive character. As clearly evident from the cluster reports and practitioner manuals (surveyed in section-4,) the majority of planned clusters initiatives are based on weak empirical analysis, an unconvincing rationale for policy intervention, and a kitchen-sink approach to the choice of policy instruments. They are also, as we would argue later, marred by weak institutional forms, inadequate attention to the process, and are grossly under-funded and under-evaluated. In short, the field of economic clusters and cluster policy includes some poorly conceived and executed initiatives.

Second, there is a dearth of evidence on the effectiveness of cluster policy interventions and their effect on actual economic clustering itself. Martin and Sunley (2003) point out that “even cluster enthusiasts find it enormously difficult to point to any examples of deliberate cluster promotion programs that have been unambiguously successful.” The state of the art in cluster policy simply is that we do not know enough about what works on the ground and what does not. While practitioner and best practice manuals have been written by consulting and research firms, none of these have actually presented any conclusive evidence in support of the many policy instruments and interventions that are often recommended and accepted on faith rather than concrete evidence of efficacy.

Meyer-Stamer (2003) explains the lack of comprehensive evidence by highlighting the political economy of such programs. Simply stated, local economic development initiatives are undertaken by democratically elected officials who face the expectation of doing something to create jobs and economic prosperity in their constituencies with little interest and motivation to put these programs under the microscope of an effectiveness evaluation. To these policy-makers, Meyer-Stamer (2003) notes, the act of appearing to do something about their constituents’ problems takes precedence over actually being able to demonstrate results. This is especially true in an area as complex as regional economic development.

Towards A New Agenda for Cluster Theorists and Practitioners

Cluster policies, with their vast popularity and brand recognition, provide the perfect means to create an aura of control where none actually exists.

This situation need not persist. The shadows of doubtful utility and efficacy that bedevil cluster theory and practice as well as cluster policy can be challenged by movement towards plans of action based on sound theory and evidence that are intended to be useful for regional economic development practitioners. This would not only require looking forward i.e. making significant advances at the cutting edge of cluster theory and practice (e.g. through the development of a theory of cluster implementation and better understanding of the inner workings of clusters,), but also looking back by reviving and applying some of the more established themes in economics, public policy, and organization literature to clusters (e.g. the rationale for policy interventions, market and government failures, and the importance of evaluation, replication, and validation.) This ambitious undertaking would require cooperation of the research and practitioner communities aimed at concurrent development and validation of new ideas, cross-fertilization across disciplines and the research and policy interface, and integration into a useful theory of clusters.

As a first step, we outline an agenda for cluster theorists and practitioners aimed at doing a better job at bringing research and analysis to bear on cluster policy and implementation. Such a program is not only necessary but also pragmatic and hence eminently doable. While we broadly divide these action items into those mainly pertaining to the research community (the providers of cluster advice) and those mainly pertaining to the practitioner community (the implementers of cluster advice), they are mutually reinforcing. Quality advice and quality implementation depend upon each other and so must be viewed as elements of a two-pronged approach aimed at bringing both rigor and utility to the conduct of cluster policy.

6.1 – The Practitioners’ Challenge: *Improving the Quality of Implementation of Cluster Policy*

The first element in improving the outcome of the advice available to decision-makers is to improve the quality of the advice and its implementation at the practitioners’ level. Several

steps may be undertaken—for example, being more rigorous and thorough in doing cluster analysis—to improve the quality of advice and implementation of whatever advice is available to the practitioners and implementers. These include, among others:

Paying careful attention to the choice of an implementation scenario (or plan) can not only be a critical test of one's understanding of the cluster but also an important factor in successful implementation of cluster policy. The three alternative implementation options (i.e. extensive-integrated and top-down, intensive-limited and bottom-up, and strategic-adaptive) are merely data points in an entire space of possible scenarios. The key to success, therefore, is not the wholesale adoption of any of these three implementation scenarios but careful and thoughtful deliberation on what cluster policy implementation might entail in the unique circumstances of a particular cluster and how might it unfold over time. More often than not, cluster studies and policy documents fail to engage in any substantive manner with this important aspect of the overall cluster policy.

Choice of an appropriate implementation scenario would require paying careful attention to a host of different factors, namely, the make-up and dynamics of the cluster, assessment of its likely evolution and the timeframe associated with it, a sense of the external (competitive) environment that might necessitate early action or afford a wait-and-see approach, the relationship between public and private actors within the region, private sector notions and expectations of what might constitute legitimate reasons for public policy intervention, a deep understanding of the overall economic and social policy framework in the region and the policy-making process itself, and a clear idea of the place of cluster policy within the overall policy environment. These are clearly complex factors and each of these must shape the manner in which cluster policy is implemented. A careful consideration of these (and other) factors must determine the optimal implementation scenario that has the highest chance of delivering a successful cluster.

Institutional aspects of cluster policy implementation may be of critical importance to effective execution. The cluster studies and policy documents we surveyed seem to confirm that cluster policy often falls short of delving into the issues and challenges associated with the actual implementation of the policy. The most important of these issues must deal with the institutional capacity to implement a set of policy objectives in support clusters.

A number of important issues must be addressed prior to the selection of an appropriate institutional form to maximize the chances of success. For example, among others: does the public sector organization championing the case for a cluster strategy or charged with creating clusters have the kind of analytic and implementation capacity to undertake cluster development on its own? What kind of institutional arrangement does the choice of the implementation scenario dictate for the subsequent implementation of the cluster policy? What skills (e.g. domain expertise, analytic and implementation capability, networks, ability to form consensus, and the ability to enforce policy) does the potential implementer require? What alternate institutional arrangements (e.g. prime-sub, public-private partnership, joint venture) could be best suited to the kind of implementation envisioned? How may conflicts of interest that might arise from particular choices of institutional forms be avoided? Careful attention to these considerations would ensure that the cluster initiative is provided with the kind of institutional capacity needed to implement the policy.

Inadequately resourced cluster initiatives not only do serious injustice to the aspirations of the champions of a specific cluster/region but also do much harm to the broader practice of cluster policy. Under-funded and inadequately resourced cluster initiatives are more common than is generally perceived. In fact, the entire issue of what it must take to develop a (set of) cluster(s) is conspicuous by its absence from the cluster literature. There are several reasons for this. Clusters initiatives have often been used as a convenient and currently fashionable political slogan without much actual financial commitment behind them. For instance, the state of Texas launched a Cluster Initiative in 2003 without explicitly allocating any resources to implement it. Further, cluster initiatives have often been funded through existing policy instruments and/or budgets of state and local economic development agencies. It is difficult to distinguish the cluster component of these agencies' development budgets from the rest. Finally, the costs of implementing cluster strategies—an important operational issue as it is—has attracted much less attention from active researchers than other issues. In addition, the implementers—consulting companies, generally—also have a vested interest in non-disclosure of such proprietary financial information. The result is that cluster initiatives often grossly underestimate the amount of financial resources it might take to implement a cluster policy (or strategy).

The optimal level of resources required to execute a cluster strategy successfully surely must vary depending upon the unique circumstances of a particular cluster and the choice of implementation scenario and institutional form. The literature is a poor guide to and provides only rough pointers. The estimates vary from a billion dollars (for Ohio's Third Frontier Program) to hundreds of millions of dollars (for the Canadian Cluster Initiative) to a few million dollars (for Basque Country, Spain.) The range further highlights the importance of accurately anticipating the costs involved and resourcing the initiative accordingly. Inadequately resourced initiatives could result in seriously diminished capacity to deliver and hence dashed expectations, at the very least, and the loss of a potentially lucrative strategic opportunity for the cluster/region, at worst.

Implementing cluster policy and strategy is a process-intensive exercise that requires developing a cluster identity, coalition-building in support for a clear vision, and action based on collaborative fact-finding. While clusters may be championed by specific individuals or triggered by an interested public sector entity, they must be implemented by a coalitions of actors, not the least important of which are the firms that inhabit the cluster. This requirement necessitates creating a broad based ownership early in the life of a proposed cluster. The process of developing a cluster vision, a strategy, and an action plan provides the first and most important opportunity not only to benefit from the ideas and perspectives of a large number of actors but also get the necessary commitment to the strategy itself. There is a growing realization, if not a clear consensus, in the practitioner community that cluster policy represents a paradigm shift in regional economic development planning away from top-down centralized planning and implementation to a more bottom-up, localized, and process intensive one. Paying inadequate attention to the process element of a cluster policy (or strategy) is thus one of the more formidable mistakes often committed by regional government and business leaders.

Realization about the importance of process is growing (Rosenfeld, 2001). Cluster development in practice implies an intensive process of community or identity-building, forging new mental maps of a region's industrial structure within the region and outside it, engendering a sense of ownership among members of the clusters, and encouraging new patterns and characters of interaction between their constituents (Taylor and Raines, 2001). Waits (2000), for example, reflects a growing consensus in the field as it highlights the

process-intensive character of the cluster strategy-making and implementation process in Arizona that involved sustained community interactions among nice industry advisory groups, six foundation working groups, eighteen regional town halls, six public forums, and a statewide town hall meeting. The result sought through such extensive deliberations is a clearly stated common vision of the region's existing and emerging clusters and a commitment to the strategy for enhancing their competitiveness. Cluster initiatives that do not fully incorporate and internalize this process dimension and/or attempt to cut corners in investing in the process and process-based legitimacy are less likely to succeed than those that do not.

Economic complexity and policy ambiguity require an implementation approach that focuses on continuously measuring progress, adaptively fine-tuning policy, and actively managing expectations of various stakeholders. Given the uncertainty and ambiguity,

flexibility and adaptability—especially at the launch of the cluster initiative—can be an important tool for cluster planners and regional economic and political leaders.

Adaptability, however, only makes sense when the quality of information about the cluster and the impact of policy interventions on cluster outcomes afford cluster planners with the possibility not only to better understand the inner working of the cluster but also fine-tune their policy interventions. Implementation and evaluation are opposite sides of the same coin. Implementation provides the experience that evaluation interrogates and evaluation provides the intelligence to make sense of what is happening (Pressman and Wildavsky, 1973). Judicious use of information provided by extensive and well-developed evaluation processes that continually feed back into the implementation effort would lead to improved policy prescription and better cluster outcomes.

Performance measurement of on-going cluster initiatives does not often move beyond the use of a few summary measures to justify ongoing investment. Post-implementation evaluation is even more uncommon. Only recently has there been some effort to develop evaluative frameworks for analyzing complex cluster policy interventions (e.g. Solvell et al., 2003; Diez and Esteban, 2000). These preliminary frameworks must evolve and mature considerably and be validated for usefulness before they will provide the information required to support an adaptive cluster policy paradigm. Pickernell et al. (2005) hold that to better understand clusters there is a need not only to examine them from a structural

perspective but also examine, in more detail, the processes at work within the clusters. Achieving this kind of resolution ability cannot be farther from the reality of existing practice in most cluster initiatives. It is, however, critical to the vitality and future health of the enterprise.

Somewhat related to but also distinct from the above is the need to manage expectations prior to and during the implementation of the cluster initiative. Developing successful economic clusters requires a series of interventions at multiple levels in the socioeconomic and political systems of a region or a country for sustained periods of time. Clusters can take anything from a decade on up before they could achieve the aspirations of their champions. Link (1995, 2002), for example, found that the Research Triangle cluster in North Carolina was predicated on 70 years of patient government intervention. When dealing with large numbers of highly disparate stakeholders—many of whom have time horizons considerably shorter than what it would take for the cluster to provide return on their investment in time and resources—it is important that the right set of expectations be developed and communicated to all stakeholders at critical instances during the life of the cluster initiative. Failure to do so could result in dashed expectations, impatience with results, and a premature perception of failure. Any of these outcomes can result in the loss of political or business support and legitimacy and can ultimately lead to the demise of the initiative itself.

It is indeed our expectation that the trend towards more systematic study of implementation is likely to grow stronger with the passage of time with implementation of cluster policies becoming the centerpiece of a new and more pragmatic research agenda on economic clusters. Dramatically improving our ability to navigate the complex and confusing terrain of cluster policies and delivering on the promise of policy-supported, if not policy-induced, economic clusters would require nothing short of a theory of cluster policy implementation. This preliminary agenda merely identifies the broad outline and scope of the intellectual challenge that we face in making the concept of economic clusters meaningful, relevant, and actionable to the (regional) economic development community. Systematic and methodologically sound research on implementation of cluster policies is clearly a work-in-progress.

These points we have raised constitute a preliminary attempt at defining a practitioners' agenda that focuses on some of the key features are likely to differentiate the more successful cluster policy interventions and initiatives from the less successful ones. They also have significant and undeniable implications for the cluster theorist and researcher. Implementation of cluster policies is one of most neglected aspects of the cluster theory that is only now beginning to receive some attention from the research and policy communities. This is broadly in line with the trends in the policy research and design, more generally, where systematic study of implementation remains an area much less professionalized than either analysis or evaluation (Pressman and Wildavsky, 1973).

6.2 –The Analysts' Challenge: *Improving the Quality of Policy Advice in Support of Economic Clusters*

The second element of the two-pronged strategy to improve the conduct of cluster policy is to enhance the quality of policy advice that is delivered to regional economic leaders and planners. This requires improving the quality and relevance of the research and analysis from which the policy advice is ultimately derived.

Developing better and more effective cluster policies requires defining a rationale for public policy interventions in support for creating economic clusters. The case for public policy intervention in support of economic cluster development is often not clearly thought through. "Broadly speaking, the arguments for cluster policy, i.e. interventions by government or other public actors in regard to development of clusters, are not yet fully established. A host of approaches are nevertheless pursued by various policy institutions but motives vary and are often vaguely formulated" (Andersson et al., 2004).

There are several reasons for the absence of such well articulated criteria. First, the case for public policy intervention in clusters has only received marginal attention in the literature. Second, more often than not, the decision to intervene has already been made even before the region's economy is subjected to a rigorous analysis aimed at identifying economic clusters and cluster trends. The type of analysis then conducted often does not provide enough insights to inform policy. Third, the eagerness to (appear to) do something and the

subsequent rush to intervene, often before a valid and unambiguous case for such an intervention has been made, results in a loss of high-level perspective on policy. The field as a whole would be well served by rediscovering some of the long established economic and policy science lessons and principles often ignored in the cluster literature.

There is also need to further develop and refine existing principles and rationales for public policy intervention. For example, under what circumstances, initial conditions, and applying what tests may the market-failure, competitiveness, and equity-based interventions be justified? What policy instruments (or interventions) make more (or less) sense within the context of each of the above-mentioned rationales for intervention? Should a policy analytic framework that classifies various policy interventions into different groups (perhaps into foundational, catalytic, or facilitating interventions, each with its own set of indicators of appropriate application) be developed to better navigate the vast space of possible interventions and rationales? How should the rationale for intervention or the choice of instrument be affected by the life-cycle stage of the cluster, its make-up, and internal dynamics? Addressing all of these issues would require extensive theory building and validation through systematic analysis of successful and unsuccessful clusters of various circumstances and forms.

Improving the quality of cluster policy advice requires ensuring linkage between cluster analysis and assessment and the subsequent policy prescriptions. Policy advice rendered in support of economic clusters too often is based more on stereotypes about what clusters are (and ought to be) than the specifics of a particular cluster. This advice often calls for undertaking a laundry list of policy actions rather than being more targeted by data and strategy. This approach is not only arbitrary but also goes against the well-established wisdom that all clusters are distinctive in terms of their make up and histories, and hence require tailored set of carefully designed interventions. Substantive findings derived from cluster analysis and assessment must be placed at the heart any policy prescriptions made at this stage. Paying inadequate attention to findings or doing only a cursory job of analyzing the cluster(s) itself is one of the most common factors that lead to a disconnect between analysis and prescription.

There is need to improve the practical relevance and value of cluster methodologies employed during cluster analysis and assessment phase. While the art and science of analyzing clusters continues to evolve with new methodologies being proposed and others refined continually, this learning should be consolidated by critically evaluating and comparing the various methodologies being used and proposed. Studying the various properties (e.g. informational value, analytical and predictive accuracy, and practical relevance) of a selected set of more commonly used cluster methods could bring substantial benefits to the cluster enterprise. Another important element of the proposed analytic exercise would be to gain insight into the marginal value of (additional) analysis in a cost-and-benefit framework that could potentially inform the trade-off in effort spent between analysis, strategic planning, and implementation.

Several issues here are worth a careful examination. For example, which of the cluster methodologies seem to provide better understanding and prescriptions and under what circumstance (e.g. type of clusters, life-cycle stage of cluster); how do the policy prescriptions derived from application of cluster analysis differ across different types of methodologies used, how large are these differences, what sort of errors and biases are present in the analysis, and how might the analyst safeguard against such errors; what sort of policy prescriptions may legitimately be derived from each of various types of cluster methodologies commonly utilized for analyzing clusters; and how much time, effort and money should be invested in analysis vs. strategic planning and implementation.

Concurrent with the need to derive policy prescription from the actual analysis of the cluster in question, there is a need to ensure that the resultant policy advice is also adequately grounded in the empirical evidence on economic clusters, in general. While it is important to derive policy prescription from a clear understanding of the cluster itself—its structure and dynamics—this must be screened against and supplemented with empirical evidence on prevalence and efficacy of policy intervention in other clusters of relevance.

One such example is the often emphasized importance of institutions for collaboration (IFCs) for cluster formation. Yet, there is little solid empirical evidence to support that such interventions actually have an impact on cluster formation, whether independently or in addition to other interventions. In fact, many have even questioned the underlying

phenomenon that forms the basis for such an advice and presented alternative theories that may lead to considerably different policy prescriptions. Also, we know from the empirical literature that economic clusters may be subject to vastly different dynamics (e.g. relative strength of externalities due to specialization or diversity) and hence policy prescriptions (e.g. those promoting specialization or diversity) depending upon factors, such as, stage of cluster lifecycle and type of firms in the cluster etc. These considerations, however, hardly ever find expression in the discussions on cluster policy.

The is clear need to seek and develop evidence on outcomes from cluster interventions often prescribed in the literature. These include, among others, venture capital development programs, business and technology incubators, science, technology, and research parks, workforce development, business networking, university-industry and inter- or intra-industry collaboration programs, special technology funding programs, and special processing zones. Many of these programs derive their popularity from popular conceptions about their usefulness or prevalence rather than concrete empirical evidence of their efficacy. With inadequate attention paid to systematic and methodologically rigorous evaluations of cluster policy interventions, it is also impossible to fine-tune these policy instruments to respond to the particular context and circumstances of a targeted cluster. Knowing that science, technology and research parks or public sector venture capital funds tend to do better in one set of circumstances than others is a valuable piece of information for those considering such policy recommendations. This kind of information, however, cannot become available unless the policy instrument is studied and its efficacy determined under a variety of contexts. A systematic effort to develop such evidence is likely to be valuable to the conduct of cluster policy in the future.

Only through concurrent improvements in the state of the art in analyzing, strategizing, and implementing cluster policy holds the promise of delivering on the promise of economic clusters.

7. SOME TENTATIVE CONCLUSIONS

Is there a role for a public policy intervention in creating or facilitating economic clusters? And given that there exists considerable ambiguity and complexity in designing and executing cluster policies (or strategies), what would be the best way to proceed?

The first of the two questions can be answered at several levels. For example, in its strictest of forms, one may ask if there exists strong and irrefutable evidence that clusters could be created by fiat through the “activist” use of public policy. Alternatively, one may take a relatively more passive view of the role of public policy in the formation and development of economic clusters and ask if public policy has any (significant) role to play in the encouraging and/or facilitating the formation of clusters of economic activity. The answer to the first question is clearly negative. There is hardly any evidence to suggest that activist public policy has, with any degree of consistency, single-handedly and irrefutably created clusters by fiat. In fact, anecdotal evidence seems to suggest that the contrary might be true. Examples of the successful and unsuccessful clusters reveal that whenever attempts were made to create clusters by fiat, they have unambiguously been unsuccessful while most of the relatively more successful and sustainable clusters (Silicon Valley, Boston, Cambridge, etc.) around the world sprang up rather spontaneously without an explicit intention to do so. True, these success stories benefited from a supportive policy regime and even direct policy interventions of various kinds but the primary and express intention behind these were never to create a cluster per se. This conclusion about the role of public policy in instigating economic clustering, however, is seriously incomplete without answering the second question.

While clusters may not be amenable to activist public policy intervention, they can definitely benefit from more thoughtful and judicious interventions aimed at facilitating the development of economic clusters. We looked at the possible rationales for public policy intervention in support of economic clusters using a three-part organizing framework. We found, not surprisingly, that public policy interventions to remove and address market-failures in clusters enjoy the most theoretical and empirical support in the literature; that policy interventions based on a competitiveness argument were not only of a more activist

nature but also enjoyed considerably less empirical support for their effectiveness; and that policy interventions based on an equity argument were not only demonstrably less effective and efficient but also, from a theoretical standpoint, the weakest of all three rationales. This, however, may not necessarily be a wholesale indictment of cluster policy but rather an admission of our lack of adequate knowledge and understanding of economic clusters and their dynamics and our ability to influence these through appropriate interventions. There is clearly ample room for more research—at a theoretical, empirical, and practitioner level—to further clarify the case for public policy intervention and develop a full-fledged theory of cluster policy design and implementation.

How are we to proceed until we gain greater clarity and certainty over the cluster policy enterprise? Section 6-2 provides a partial answer to the question. In short, as we redouble our efforts towards achieving greater clarity and perspective on cluster policy interventions through purposeful and pragmatic research that integrates various streams of knowledge and activity and advances our understanding of how clusters are formed, what is their inner workings, and how might they be influenced, we must carry forward to provide the best available advice to regional economic leaders and planners that are already in the process of implementing such initiatives worldwide.

A model of adaptive policy-making and continuous and iterative learning that rests on the cyclical interactions between the three pillars of cluster policy, implementation, and evaluation is perhaps the best way to proceed given the complexity and uncertainty in the regional economic policy, in general, and cluster policy, in particular. Only such an approach that pays due emphasis on the process dimension of cluster policy-making, manages the expectations of various stakeholders, continually aligns their interests vis-à-vis the region/cluster, makes a serious and credible attempt to understand the inner working and dynamics of the cluster, evaluates performance (both process and outcomes), and adapts the cluster policy (and strategy) to incorporate new learning and changing circumstances has a credible chance of success. While the literature has advanced considerably since Porter's cluster theory was first presented in the 1990s, there is still a long way to go before it would be possible to redeem the promise of cluster-based economic development.

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