

Clusters in the Caribbean

Understanding their Characteristics, Defining Policies for their Development

Prepared for the Competitiveness and
Innovation Division by:

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In collaboration with:

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**Institutions for
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**Competitiveness and
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Abstract*

The aim of this paper is to map Caribbean clusters and identify their specific characteristics based on existing literature and available empirical evidence. A desk review of 32 clusters distributed across the Caribbean looks at natural resources (agriculture, agro-processing, forestry, aquaculture, and energy), manufacturing, and services (tourism, creative industries, and business services) industries. Three groups of clusters are identified: *rising*, *innovative*, and *sluggish*. Based on this classification, policy recommendations are provided considering the diverse characteristics of the investigated clusters.

Keywords: Caribbean, clusters, collective efficiency, industrial policy

JEL codes: O54; O25; O14

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Table of Contents

Executive Summary	4
1. Introduction	7
2. Main Features of Clusters	7
2.1. Baseline Definition of Cluster: Geographical Concentration and Sectoral Specialization.....	7
2.2. Cluster Organization Structure.....	9
2.3. Collective Efficiency	10
2.4. Innovation in Clusters	11
2.5. Openness	12
2.6. Cluster Life Cycle.....	14
2.7. Cluster Policies	15
3. Classifying Clusters.....	16
3.1. The Cluster Structure.....	18
3.2. Collective Efficiency	18
3.3. Innovation Capacity	18
3.4. Openness	19
3.5. Stages of the Cluster Life Cycle	19
3.6. The Role of Policies	20
4. The Caribbean Clusters	21
4.1. Cluster Structure.....	21
4.1.1. Sectoral specialization.	21
4.1.2. Geographical boundaries.....	24
4.1.3. Organizational structure.....	24
4.2. Collective Efficiency.....	25
4.2.1. External economies.	25
4.2.2. Joint action.....	29
4.3. Innovation Capacity	31
4.4. Openness	34
4.5. Stages of the Life Cycle	36
4.5.1. Emerging clusters.	37
4.5.2. Growing clusters.	37
4.5.3. Sustaining clusters.....	37
4.5.4. Declining clusters.....	37
4.6. Cluster Policies	38
4.6.1. Spontaneous clusters.	39
4.6.2. Clusters with policy for development.....	39
4.6.3. Clusters with policy for inception.....	40

5. A Typology of Clusters	40
5.1. Cluster Analysis	40
5.1.1. The rising clusters (Group 1).....	43
5.1.2. Sluggish clusters (Group 2).....	43
5.1.3. Innovative clusters (Group 3).....	44
5.2. Characteristics of Rising, Innovative, and Sluggish Clusters and Appropriate Policies	45
6. Concluding Remarks on the Future Prospects of Clusters in the Caribbean.....	48
References	50
Appendices	53

Executive Summary

During the past two decades, industrial clusters have successfully driven growth in developed countries in Europe (e.g., Italy, Germany, and the United Kingdom), the United States, and Japan. These success stories have attracted interest from scholars in development studies and policymakers at international organizations such as the United Nations Industrial Development Organization (UNIDO), the United Nations Conference on Trade and Development (UNCTAD), the Inter-American Development Bank (IDB), and The World Bank.

Caribbean economies face challenges such as climate change, low productivity, high emigration rates, high public debt, poor regional linkages, narrow scope to build economies of scale due to the small size of their domestic markets, and high susceptibility to exogenous shocks due to their openness. An approach that focuses on clusters and their characteristics—such as collective efficiency, information and knowledge sharing, division of labor, sharing of specialized inputs, and collective access to market—suits the Caribbean countries. Clusters are an opportunity for Caribbean economies and their enterprises, in particular small and medium enterprises (SMEs), to access larger and more sophisticated markets, improve knowledge and technologies, train specialized human capital, and lobby governments for infrastructure and specific policy support that would be unavailable to individual companies.

The aim of this paper is to map Caribbean clusters and identify their specific characteristics based on existing literature and available empirical evidence. A desk review of 32 clusters distributed across the Caribbean looks at natural resources (agriculture, agro-processing, forestry, aquaculture, and energy), manufacturing, and services (tourism, creative industries, and business services) industries.

On the basis of prior academic work, the empirical evidence was carefully analyzed along six cluster dimensions considered to influence their competitiveness. Each dimension is assessed on quali-quantitative grounds, meaning they are based on a very detailed analysis of available documents, with each dimension measured quantitatively, typically using Likert scales or other categorical classifications. The six dimensions are the following:

1. Cluster Structure
 - Sectoral specialization
 - Geographical boundaries
 - Organizational structure (survival, Marshallian, or hub-and-spoke)
2. Collective Efficiency: The sum of:
 - *external economies*: specialized labor market, availability of inputs, access to information, and market access, and
 - *joint action*: backward and forward linkages, horizontal bilateral linkages (i.e., cooperation between firms working at the same stage of the value chain), and multilateral linkages (i.e., cooperation among firms, public, public–private organizations at the local level, local associations, chambers of commerce, non-governmental organizations [NGOs], or any other local actor, including universities and research centers).

3. *Innovation Capacity*: Taking into account:
 - the knowledge and technological base of the cluster firms,
 - the intra-cluster knowledge system,
 - the extra-cluster knowledge system, and
 - the innovation system.
4. *Openness*: Classifying clusters on the basis of how open they are based on:
 - export orientation,
 - presence of multinational corporations (MNCs) in the cluster (foreign and local), and
 - cluster firm participation in global value chains (GVCs).
5. Stages of the Cluster Life Cycle
 - *Emerging*: A small number of actors and low or low/medium joint action and semi-open knowledge networks.
 - *Growing*: The number of actors is increasing and there is medium or high joint action and open knowledge networks.
 - *Sustaining*: A large number of actors and medium or high joint action and open or semi-open knowledge networks.
 - *Declining*: A large number of actors and low or low/medium joint action and closed knowledge networks.
6. *The Role of Policies*: Whether cluster formation or development has been promoted by policy interventions:
 - Spontaneous clusters with no sign of policies for establishment or development.
 - Clusters with policy from inception, when clusters have been founded through policy interventions.
 - Clusters with policy for development, with the cluster development process being supported by policies.

Based on these key cluster dimensions, through cluster analysis—a multivariate statistical technique that serves to identify different groups of similar actors—we found three groups of clusters. Two—*rising* and *innovative*—are fairly similar and markedly different from *sluggish* clusters.

Rising clusters include mainly emerging and growing clusters at the early stages of their life cycle. In this group, clusters specialize in industries relatively new to the Caribbean, such as the animation and multimedia, or they exploit new market segments, such as eco-tourism in Grenada, Guyana, and Suriname. Moreover, they tend to be very open to external actors, partially because they are populated with hub firms. In fact, this group includes all of the hub-and-spoke clusters identified in this study. This organizational structure facilitates external connections for cluster-based firms because it allows access to knowledge and markets. Two examples from Guyana are the coconut water cluster, which is organized around a processing firm from Trinidad and Tobago, and the non-traditional agricultural products cluster, which is led by an Israeli MNC. In spite of being open and growing, these clusters do not display outstanding records in terms of collective efficiency or innovative capacity, which we classified as medium. Hence these clusters deserve policy attention to further sustain cluster development.

Innovative clusters share some similarities with *rising* clusters (i.e., high openness), but, as clear from the name, are more innovative. This group is composed of Marshallian clusters displaying high collective efficiency and innovation capacity. The sectors of specialization include some of the traditional industries in the region, such as the oil sector and business, financial, and maritime services, as well as the very dynamic aquaculture clusters in Guyana and Belize. This group appears to include the most successful clusters in the region, and most have been assisted by cluster policies.

Sluggish clusters differ significantly from the other two groups. They are far less active and dynamic, with, on average, low to medium collective efficiency, very weak innovation capacity, and a low degree of openness. They are organized as Marshallian clusters, meaning mainly small local enterprises that interact at subnational, urban, or national levels populate them. In some cases, the firms only target the local market, which clearly constrains further growth, such as the pottery and retail clusters in Trinidad and Tobago, and the gold jewellery cluster in Guyana. *Sluggish* clusters include several spontaneous clusters that have not received any policy treatment, and many would benefit from cluster policies.

To conclude, *rising* and *innovative* clusters are the most dynamic, innovative, open, and collaborative in the Caribbean region, with differences in terms of innovation capacity, cluster life cycle, and organizational structure. In contrast, *sluggish* clusters are the most passive and backwards in the region.

Based on this classification, we recommend diverse policies for the different groups of clusters. Policies for *rising* clusters should focus on (i) fostering innovation, (ii) helping emerging clusters transition to a growing phase, and (iii) supporting consolidation of the leading actors. *Innovative* clusters are the most successful in the region. Policies for these clusters should very selectively promote promising projects. Since these clusters are already dynamic, such dynamism should be enhanced and sustained by targeting projects that are likely to further push these clusters to the frontier of knowledge or to allow them to serve highly demanding markets or market niches. Finally, priorities for *sluggish* clusters should be (i) strengthening local joint action, (ii) enhancing openness to valuable resources like knowledge and technologies, and (iii) building innovative capabilities. It is necessary to systematically monitor and evaluate whether measures targeted at clusters deliver the expected results in terms of enhanced local inter-firm coordination; networking with extra-cluster actors; and economic, social, and environmental performance. Monitoring and evaluation should become part of the standard practice to foster necessary and continuous processes of experimentation and policy learning.

1. Introduction

During the past two decades, industrial clusters have successfully driven growth in developed countries in Europe (e.g., Italy, Germany, and the United Kingdom), the United States, and Japan. These success stories have attracted interest from scholars in development studies (e.g., Schmitz, 1995; Rabelotti, 1999) and policymakers at international organizations, such as UNIDO, UNCTAD, the IDB, and The World Bank. An important question has been the experience of clustering in other geographic regions.

Caribbean economies¹ face challenges such as climate change, low productivity, high emigration rates, high public debt, poor regional linkages, and narrow scope to build economies of scale due to the small size of their domestic markets, and high susceptibility to exogenous shocks due to their openness. An approach that focuses on clusters and their characteristics—such as collective efficiency, information and knowledge sharing, division of labor, sharing of specialized inputs, and collective access to market—suits the Caribbean countries. Clusters are an opportunity for Caribbean economies and their enterprises, in particular their SMEs, to access larger and more sophisticated markets, improve knowledge and technologies, train specialized human capital, and lobby governments for infrastructure and specific policy supports that would be unavailable to individual companies.

The aim of this paper is to map Caribbean clusters and identify their specific characteristics based on existing literature and available empirical evidence. A desk review of 32 clusters distributed across the Caribbean looks at a variety of industries.

The next section of this paper provides a definition of the cluster concept and reviews the relevant academic literature. The following section presents the criteria for classifying the cluster cases. The empirical cases from the Caribbean region are then classified. Finally, some conclusions and policy implications are discussed.

2. Main Features of Clusters

In this section, we selectively review the literature on clusters, focusing on the main characteristics adopted as classification criteria in the mapping exercise of the Caribbean clusters.

2.1. *Baseline Definition of Cluster:*

Geographical Concentration and Sectoral Specialization

The baseline definition of a cluster considers the co-existence of two main characteristics: the concentration of firms in a spatially bounded area and their specialization in the same or related industries. There are clusters with both of these characteristics in many developing countries, with a wide range of well-documented cases in Latin America (e.g., Pietrobelli and Rabelotti,

¹ This paper focuses on the beneficiaries of the Compete Caribbean program: Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica Republic, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

2007). One of the key drivers that generates clusters is their proximity to a natural resource or market. This explains, for instance, why tourist activities are co-located near natural attractions and why producers of consumer goods set up shop near large urban areas to reduce transport costs.

The spatial extension of clusters can vary a great deal. We distinguish between local, urban, national, and inter-country clusters. The firms in *local* clusters operate in a geographically bounded area that is rural or industrial outside the main cities—*not* urban. This includes clusters with regional boundaries (as in the European Union sense of territorial subdivisions of countries) or even smaller areas (e.g., an agglomeration of a few small cities or villages). Examples of subnational clusters are the Italian industrial districts, often centered on middle-size cities such as Prato in Tuscany or Biella in Piedmont (Becattini, 1990) and the Silicon Valley in the United States (Saxenian, 1996). *Urban* clusters coincide with large cities. Creative, cultural, and service industries are often clustered in such a way, such as the financial sector in London, the Bollywood film cluster in Mumbai, or the software production cluster in Bangalore (Lorenzen and Mudambi, 2013). While local and urban clusters have tended to be the most conventional form of clusters, in some cases, scholars have loosely interpreted their geographical boundaries (e.g., Porter, 1998) and introduced a type of cluster whose boundaries are set by national borders—*national* clusters. According to Porter, clusters are geographical concentrations of interconnected companies and institutions in a particular field, with a geographic scope ranging from a single city to a state, a country, or even a network of neighboring countries. Whole states, such as California, or countries, such as Sweden are among Porter's examples. Finally, clusters may transcend national borders and extend to other countries—*inter-country* clusters—such as the Danish-Swedish Öresund biotech cluster (Andersson, Schwaag-Serger, Sörvik, et al., 2004). *Inter-country* clusters are particularly relevant in the Caribbean given the very small size of many of its island countries.

The sectoral specialization of clusters is another important dimension, and it usually implies that cluster firms operate in sectors that are related to each other. As pointed out by Giuliani, Pietrobelli, and Rabellotti (2005), the organization of production, the relevance of firms' economies of scale, the technological complexity, and the modes and sources of innovation differ across sectors, and these differences may impact their growth trajectories. As remarked earlier, clustering economic activities is a widespread phenomenon around the globe and many industries tend to concentrate spatially. For instance, many Italian industrial districts² have specialized in low tech, labor intensive manufacturing industries, such as the so called 'Made in Italy' sectors like clothing and textiles, footwear and leather, furniture and tiles. In many developing countries there are also many clusters specialized in these industries. But clusters are also present in medium- and high-tech industries, such as automotive, consumer electronics, machinery and mechanical, information and communications technologies (ICT), biotech, and green technologies. Firms operating in natural resource industries also cluster geographically because they set up their activities to directly exploit localized resources

² In Italy, clusters are usually called industrial districts, referring to the Marshallian concept used to describe textile-producing areas of Great Britain during the Industrial Revolution (Marshall, 1920).

(e.g., copper, oil, fruit and fish, which are widespread in developing countries). Moreover, natural and cultural attractions represent a source of agglomeration for clusters specialized in the tourism sector. Finally, economic activities are also geographically clustered in the tertiary industry. There are clusters specialized in creative industries, including advertising, film and video, music, performing arts, publishing, and fashion, as well as in the financial sector. As described above, these industries are *urban* in nature, as they tend to cluster in the largest urban agglomerations, where they can play an important role in local economics (Lazzaletti, Domenech, and Capone, 2008; Scott and Ellis, 2000).

2.2. Cluster Organization Structure

The internal organization of clusters varies widely, even within the same industry. Although real world clusters are very complex, cluster analysts and scholars have proposed classifying clusters according to a number of organizational dimensions, including the size of firms, the nature and characteristics of their relationships, and the degree to which they depend on external organizations. On these grounds, and drawing on Markusen (1996) and Altenburg and Meyer-Stamer (1999), we classify clusters as follows.

Marshallian clusters, which are directly related to the concept of Italian industrial districts proposed by Becattini (1990), are characterized by the spatial concentration of small and locally owned firms and a high division of labor, with firms specialized in different phases of the local productive chain and strongly interacting with each other. This kind of cluster often includes a strong social dimension and is therefore considered to be a place where entrepreneurs are well embedded in a local community of people, characterized by a relatively homogenous system of values and norms, a strong local identity, and well-developed supporting institutions that facilitate the development of trustful interactions. Obviously, Marshallian clusters are not restricted to Italy; there are examples of this kind of cluster with identifying features that vary a great deal in other developed and developing countries (Rabellotti, 1995). Pietrobelli and Rabellotti (2007) showed that in Latin America and the Caribbean (LAC) the division of labor within a cluster, the degree of trust, and the intensity of collaboration can be very diverse. On the basis of these empirical results, we adopted a loose definition of Marshallian clusters, including a critical mass of specialized SMEs and some backward and forward providers. We expect to find a large diversity of clusters in this category.

Hub-and-Spoke clusters include one or more firms (sometimes MNCs) that act as anchors or hubs to the local economy and orchestrate the local network of suppliers and related activities (Markusen, 1996). The large hub firms often have substantial links to suppliers, competitors, and customers outside the district. These external connections are an interesting dynamic feature of this model because they can recognize when innovation and creative activities are

taking place in other locations and enable the transfer of new ideas and technologies to the cluster.³

Survival clusters include (mainly informal) micro and small-scale enterprises that produce low-quality goods for local markets, mainly in activities where barriers to entry are low. These clusters are particularly relevant in less developed countries. Firms in these clusters display many characteristics of the informal sector, with poor productivity records and wages far below the national average. The degree of inter-firm specialization and cooperation is also rather limited, reflecting the lack of qualified and skilled employees in the local labor market, as well as a fragile social fabric (Altenburg and Meyer-Stamer, 1999). There are many survival clusters documented in LAC. They often specialize in traditional industries such as clothing, footwear, furniture, auto repair, and food processing.

It is important to notice that real-world clusters may be a mix of one or more of the above-mentioned types and that clusters are dynamic systems, changing over time, both in absolute terms—consistent with the evolution of their member firms, workers, and institutions—and in relative terms, that is, compared to other clusters. Hence, classification may evolve through time.

2.3. *Collective Efficiency*

The simple fact of being located in clusters (i.e., geographical agglomerations of firms operating in the same or in interconnected sectors) does not make firms more successful. The heightened economic performance of cluster firms is often due to the co-occurrence of other factors (e.g., inter-firm division of labor and wide networks of suppliers and business associations) that are common in clusters in advanced countries and that are often considered to manifest themselves within clusters in developing countries. To account for these factors, Schmitz (1995) introduced the concept of *collective efficiency*, defined as the competitive advantage derived from local incidental external economies and consciously pursued joint action.

In *Principles of Economics*, Marshall (1920) first introduced the concept of *external economies* (EEs). He defined EEs as the unpaid, positive or negative, side effects of the economic activity of one economic agent on other agents. In clusters, the most common external economies are generated by the following conditions:

- Pooling specialized skilled labor, which increases the likelihood of hiring already trained workers.
- Creating a local market for inputs, machinery, and specialized services to facilitate increased availability, and competition on price, quality, and service.
- Easily accessing specialized knowledge and rapidly disseminating information.
- Attracting customers to the market as a result of the concentration of producers.

³ Markusen (1996) refers to *satellite* clusters, which consist of a congregation of branches of externally based multi-plant firms that are often MNCs. Their localization is often the result of national or local policies and takes the form of export processing zones. We do not consider this type of cluster in this study.

Schmitz (1995) found that clustered firms benefited from external economies just by being there and thus he considered them to be passive forces. According to Schmitz (1999), spontaneous external economies are important in explaining the competitiveness of clusters, but he also suggested that consciously pursued *joint action* by local firms and/or other organizations are an important driver of clusters' competitiveness. Joint action is in turn facilitated by strong social ties and high levels of trust among co-located firms and entrepreneurs (Nadvi, 1999). Schmitz (1999) identified three forms of joint action:

1. *Bilateral vertical*: Collaboration along the value chain (e.g., between client and supplier firms).
2. *Bilateral horizontal*: Collaboration between two or more cluster enterprises specialized in the same industry, including jointly marketing products, jointly purchasing inputs, sharing orders, sharing specialized equipment, jointly developing products, and exchanging expertise and market information.
3. *Multilateral*: Collaboration between a wide variety of actors, particularly between firms and cluster-wide organizations such as business associations and business development service centers. Multilateral joint action includes cooperation among complementary cluster firms and supporting institutions and business associations.

The combination of incidental external economies and joint action determine the degree of cluster collective efficiency. The presence of both forces is crucial for competitiveness: passive external economies may not suffice without joint action, and joint action hardly ever develops in the absence of external economies.

2.4. *Innovation in Clusters*

Scholars have long recognized that innovative activities are spatially concentrated (Audretsch and Feldman, 2004). This is mostly ascribed to the fact that the innovation process involves sharing tacit knowledge, which requires face-to-face interactions and geographical proximity. The conventional understanding of innovation in clusters considers it to be due to localized knowledge spillovers—a form of externality that is generated by the interaction of geographically concentrated and specialized firms, as well as by imitation and demonstration effects. In that context, the innovative processes of clusters are seen as the result of a collective learning process, involving local entrepreneurs and employees who contribute to and benefit from a pool of local knowledge fairly homogeneously (Capello and Faggian, 2005).

Against this background, more recent studies show that knowledge in clusters may not circulate as smoothly as previously described and propose that firms' own knowledge bases (or innovation capabilities) influence both their capacity to generate local spillovers, as well as to benefit from these spillovers by absorbing local knowledge (Giuliani and Bell, 2005). Moreover, scholars have highlighted the importance of extra-cluster networking as a way to rejuvenate the cluster knowledge base and avoid processes of negative lock-in (Bell and Albu, 1999; Bathelt, Malmberg, and Maskell, 2004). In this respect, a growing number of studies focus on the role leading firms play in clusters. Leading firms are typically large and technologically advanced and act as a bridge between non-local knowledge and the majority of small firms (Bell and Albu,

1999; Giuliani and Bell, 2005). These firms have been defined as technological gatekeepers and are key actors in channeling extra-cluster knowledge into the local intra-cluster knowledge system (Giuliani, 2011; Morrison, 2008).

External connections to actors in the innovation system are also important. Thus knowledge linkages with different types of organizations—such as universities, vocational schools, technology agencies, research and development (R&D) centers, and other economic and political institutions—can affect technology and knowledge diffusion in clusters (Lundvall, Joseph, Chaminade, et al., 2009). The location of these organizations may vary from local to national levels, meaning they may be part of the local, regional, or national innovation system.

Based on the above considerations, the innovation capacity of clusters is related to four interrelated factors: (i) the knowledge base of the cluster firms, (ii) the intra-cluster knowledge system, (iii) the formation of linkages with extra-cluster sources of knowledge (i.e., the extra-cluster knowledge system), and (iv) the degree of development of the (local, regional, national) innovation system in which the cluster is embedded. Adapting from Giuliani (2005), cluster innovation capacity can thus be defined as:

- Low
 - Cluster firms have weak knowledge⁴ and technological bases far from the technological frontier, with low-skilled human resources and very limited in-house capacity to generate knowledge,
 - The cluster has very limited and weak knowledge linkages between firms.
 - The cluster has no links with extra-cluster sources and there are no technological gatekeepers.
 - The innovation system is weak, with a very underdeveloped knowledge infrastructure.
- Medium
 - Some firms in the cluster have good knowledge and technological bases and can adopt and adapt knowledge and technologies generated in other places (e.g., international knowledge) to their local needs, but their knowledge-generating potential is limited and generally oriented at improving products on an incremental and adaptive basis.
 - The cluster has a more connected intra-cluster knowledge system.
 - The cluster has some interconnections with extra-cluster sources of knowledge and there are a few local technological gatekeepers.
 - There are some knowledge institutions within the cluster, such as vocational schools, universities and technological centers supporting the innovation process.
- High
 - Most firms in the cluster have very good knowledge and technological bases and have skilled human resources.

⁴ In this paper, the term knowledge is used to refer to all types of knowledge that are not necessarily machine-embodied, like expertise in a given field or the capacity to design or develop a service or a product.

- The cluster has a dense intra-cluster knowledge system.
- The cluster is well connected with extra-cluster sources of knowledge and many firms play the role of technological gatekeepers.
- The innovation system is well developed, with a specialized knowledge infrastructure highly integrated with cluster firms.

2.5. Openness

The literature on clusters has traditionally focused on local sources of competitiveness—local collective efficiency (the section on collective efficiency above)—often neglecting the increasing importance of external actors and sources of high value assets such as knowledge and technology. However, extant research shows that when firms are *too embedded* in local networks, their innovative performance decreases because firms get trapped in redundant and therefore poorly innovative ties (Giuliani, 2013). Indeed, extensive evidence on Latin America reveals that both the local and the global dimensions matter and firms often participate in intra- and extra-cluster networks and both types of networks offer opportunities to foster competitiveness through learning and upgrading (Pietrobelli and Rabellotti, 2007).

Exports of local production are typical channels through which clusters open up to international markets. It is well known that exports offer many opportunities to learn and to improve efficiency, as documented in the literature on learning from exporting (see Wagner, 2007 for a survey). The advantages of exporting also include attracting foreign customers to the cluster, which enhances local external economies. This effect is especially beneficial when there is a critical mass of exporting firms that have acquired a good reputation in international markets and have allowed relevant information about foreign markets to circulate at the local level. Moreover, establishing export consortia or strategic alliances has also been documented as improving joint action in clusters (Rabellotti, 1998), while exports have often stimulated firms to share the costs of participating in international trade fairs or organizing promotional missions to foreign countries, often through the local business associations (Belso-Martínez, 2006).

Another way cluster firms connect to external actors is through foreign direct investment: MNCs investing in the cluster and cluster firms investing abroad. MNCs may have an interest in investing in clusters if they intend to tap into local capabilities and knowledge, to participate in local collective learning and collaboration activities (Porter, 1990; Enright, 2000). From the point of view of local firms, interactions with MNCs can generate spillover and imitation effects and can stimulate direct innovation efforts, particularly in the case of supplier linkages (Barba Navaretti and Venables, 2004).

The internationalization of local firms and their becoming MNCs is another key channel to open clusters, provided the MNC remains embedded in the cluster. Studies on Italian industrial districts have documented that local MNCs tend to reduce the level of local subcontracting and local connections in general, while at the same time relying more on external links, to enhance skills and access knowledge.

Finally, another important way cluster firms connect to external actors is by participating in GVCs, which have become a dominant model in organizing global production (Gereffi, 1999).

Humphrey and Schmitz (2002) discussed the opportunities for local producers to learn and access knowledge and technologies through the global in GVCs. Accordingly, the involvement of cluster firms in GVCs is considered to enhance cluster firms' innovation performance, because these firms are under strong pressure to comply with the qualitative requirements of chain leaders and to therefore upgrade their products and production standards. However, being part of a GVC does not imply firms will automatically upgrade, as shown in a study on Latin America by Piore and Sofer (2007). Based on a number of case studies in different countries and sectors, the authors concluded that the mode of governance of the value chain, as well as the sectoral specificities of the cluster, influenced the extent to which local firms managed to upgrade and how they undertook it.

All in all, we maintain here that a cluster's degree of openness depends on its exports, on the presence of MNCs in the cluster (both foreign and local), and on local firms' involvement in GVCs.

2.6. Cluster Life Cycle

So far we have considered clusters as static organizations, but they are in fact complex adaptive systems made up of different components with evolving functions and interrelationships. As argued by Martin and Sunley (2011):

“Clusters come and go; they emerge, grow, may change in complexion and orientation, may undergo reinvention and transformation, and may eventually decline and even disappear. In short, they evolve.” (p. 1,300)

Clusters have their own life cycle, which may differ from that of their industry (Menzel and Fornahl, 2010), as well documented by the work of Saxenian (1996) about the Boston and Silicon Valley high tech clusters. Other studies have also documented a difference in performance between clustered and non-clustered firms, a difference that varies according to the stage of the cluster life cycle. For example, clustered firms outperform non-clustered ones at the beginning of the life cycle and perform worse at the end of the cycle (Audretsch and Feldman, 1996; Polder and John, 1996). According to Menzel and Fornahl (2010):

“This shows that the cluster life cycle is more than just a local representation of the industry life cycle and is prone to local peculiarities.” (p. 206)

Menzel and Fornahl (2010) identified four different stages of the cluster life cycle based on four dimensions:

1. *Quantitative direct*: Size as measured by the number of actors, such as companies and other organizations (e.g., universities, R&D centers, and business associations), and by the number of employees.
2. *Qualitative direct*: Intra-cluster heterogeneity in terms of the diversity of knowledge and competencies available among the local actors.
3. *Quantitative systemic*: The innovative environment of the cluster, meaning the individual companies and their innovative capabilities as affected by the action and behavior of

other actors in the cluster and the existing opportunities for cluster firms to undertake joint actions.

4. *Qualitative systemic*: Measured by the cluster's ability to exploit synergies and networking opportunities.

On the basis of these characteristics, Menzel and Fornhal (2010) suggested that the cluster life cycle is characterized by four phases:

1. *Emerging*: Few companies characterized by rather heterogeneous knowledge bases and competencies, which limits the possibilities for local networks and joint action. If there are initial positive conditions, such as a strong knowledge base or political support, the emerging cluster becomes a growing cluster and companies reach a critical mass, otherwise the cluster loses its potential for growth.
2. *Growing*: Characterized by a strong increase in employment, in the number of cluster companies, and in the size of the companies. The cluster becomes more focused and there are growing opportunities for collective action and networking among local actors.
3. *Sustaining*: An equilibrium state. There are two ways sustaining clusters can evolve: (i) decreasing diversity ends in a decline or (ii) new heterogeneity develops within the cluster, creating a new growth phase, rejuvenating the cluster.
4. *Declining*: Characterized by a decline in the number of companies and employees and by being locked into its previously successful path. There are three possibilities for the declining stage of a cluster to end: (i) the progressive disappearance of the cluster, (ii) a renewal of the existing development path, often thanks to the injection of external resources, and (iii) the transition to a completely different field, integrating new external actors.

2.7. Cluster Policies

Cluster policies are considered a means to promote economic development and structural change, often by enhancing innovation capacity. In advanced countries, cluster policies have a long tradition and a large diffusion. A survey conducted in 2012 by the European Cluster Observatory (2012) identified 578 cluster initiatives; in the United States, the Small Business Administration has launched 40 cluster initiatives; while in Japan the Ministry of Economy, Trade and Industry supports over 100 clusters, mostly in high tech sectors (Pietrobelli, Casaburi, and Maffioli, 2013). Cluster policies are also widespread in developing countries, in particular in LAC. They are increasingly adopted by national and regional governments, as well as by international organizations, as a means of promoting development of the private sector (Pietrobelli and Stevenson, 2011).

In some cases, cluster policies aim to promote clusters from scratch by providing a tailor-made context in which firms aggregate, cooperate, and generate external economies. A case in point is industrial and technology parks. In most cases, however, cluster policies aim to strengthen or promote existing clusters, and different types of policy measures are applied to clusters depending on their characteristics and needs (e.g., levels of collective efficiency, degree of innovation, and cluster life cycle). For emerging clusters, for instance, policies have been

designed to encourage collaboration among local actors, sustain local firms to become brokers of knowledge or technological gatekeepers, or even to facilitate the birth of new enterprises. In growing clusters, policies may instead play a key role in sustaining and enhancing the development of a dynamic systemic context by supporting local universities and R&D centers, and by providing specialized collective goods such as education and training skilled human capital. In sustaining and declining clusters, policy is essential to encourage openness and innovation in a bid to revitalize the local industry, but also to promote diversification into other more profitable industries.

These examples suggest that the design of cluster policies needs to be tailored to the specific context of each cluster. Cluster policies need to be flexible and to adapt to local needs. Moreover, they should not be expected to produce immediate results because they often depend on trustful relationships between local actors and this takes time, which may lead to time inconsistency problems with the political cycle.

Cluster policies consist of different types of policy instruments, among which the following are particularly prominent (OECD, 2007):

- *Policies to engage actors:* Activities designed to build trust, financial incentives for networking organizations, and sponsorship of networking activities.
- *Providing collective services and business linkages:* Activities oriented to improve production capacity based on the scale and skills of suppliers, fostering the formation of external linkages and supporting cluster firms' inclusion in GVCs, and supporting SMEs to adopt international standards of production and to training human capital.
- *Collaborative R&D and commercialization:* Oriented to programs that increase industry–university links, commercialize the results of such collaborative research, and ensure financial support for spin-off firms.

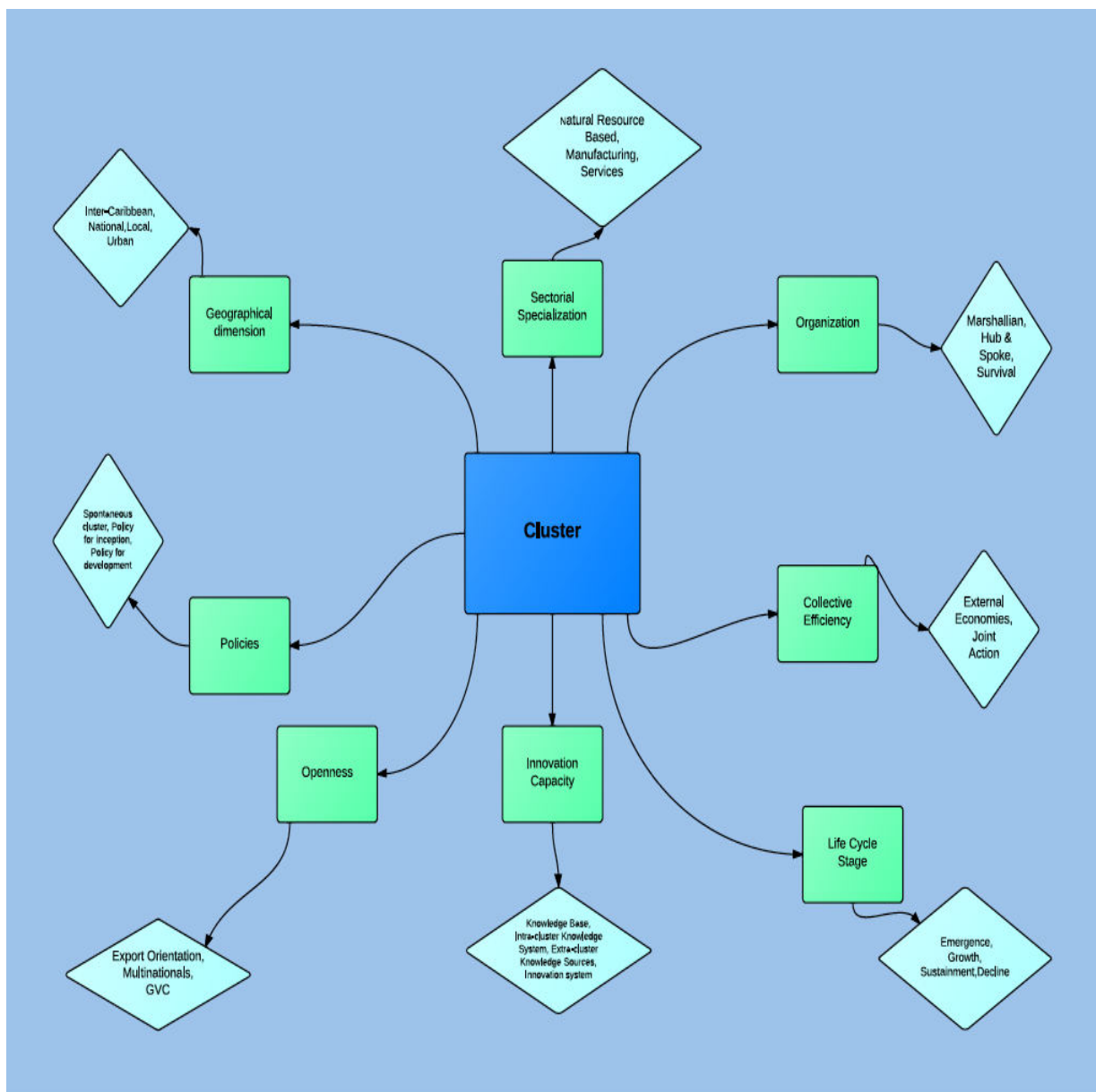
3. Classifying Clusters

This paper is based on a desk review of 32 cases of Caribbean clusters. The survey of these cases was based on two sources. First, we relied on the material provided by the institutions promoting this study—the IDB and Compete Caribbean—which suggested a large number of the cases in the analysis. Second, we searched academic studies, policy reports, and grey literature available through different sources and often available online on the web page of acknowledgeable institutions. After, key informants assessed the validity of our search and supported the representativeness and diversity of the clusters in the region chosen for analysis.

The cases include examples from the main industries in the Caribbean economies: natural resources based (agriculture, agro-processing, forestry, aquaculture, and energy), manufacturing, and services (tourism and creative). They are located in several countries that are among the beneficiaries of the Compete Caribbean program: Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

The empirical evidence collected (see Appendix 1 for the full list of documents) was carefully analyzed along six cluster dimensions that we believe influence their competitiveness (see Figure 3.1) based on prior academic work. Each dimension was assessed on quali-quantitative grounds. Based on a very detailed analysis of the text, we measured each dimension quantitatively (typically using Likert scales or other categorical classifications). In reviewing documents about the cluster case studies, we considered the context presented and the specific wording, trying to minimize biases and misinterpretations, complementing and cross-referencing information in all possible ways. To reduce subjective interpretation and biases, two different people read the case studies and independently assessed each case quantitatively. Discordant cases were further analyzed until a decision was made for each case.

Figure 3.1: The Six Dimensions for Cluster Classification



Of course, as with any study of this kind, there may be problems related to the accuracy of the results, which therefore calls for cautious interpretations.

In what follows we describe how each dimension is measured. Table 3.1 provides a summary.

3.1. *The Cluster Structure*

The Caribbean clusters are characterized along three sub-dimensions:

- *Sectoral specialization*: the main sector of activity (e.g., agro-processing, tourism, creative services).
- *Geographical boundaries*: urban, local, national, or inter-Caribbean.
- *Organizational structure*: survival, Marshallian, or hub-and-spoke.

3.2. *Collective Efficiency*

Clusters are characterized along two sub-dimensions (Giuliani et al., 2005):

1. *External economies*: specialized labor market, availability of inputs, access to information, and market access.
2. *Joint action*: Backward and forward linkages, horizontal bilateral linkages (i.e., cooperation between firms working at the same stage of the value chain) and multilateral linkages (i.e., cooperation that involves firms, public, public-private organizations at the local level, local associations, chambers of commerce, NGOs, or any other local actor, including universities and research centers).

To quantify the degree of collective efficiency, we carefully evaluated each cluster's external economies and joint actions. The intensity of each allowed us to classify the clusters on a 5 point Likert scale, reflecting the intensity external economies and joint actions: *Low (1), Medium/Low (2), Medium (3), Medium/High (4), and High (5)*. Once a Likert point was attributed to each sub-dimension (e.g., bilateral vertical joint action, bilateral horizontal joint action, and multilateral joint action), we took the average value as a synthetic indicator of external economies and joint actions.

3.3. *Innovation Capacity*

We codified cluster innovation capacity using a 5-point Likert scale, as follows: *Low (1), Medium/Low (2), Medium (3), Medium/High (4), and High (5)*. Within innovation capacity, we considered and coded four sub-dimensions:

1. The knowledge and technological base of the cluster firms.
2. The intra-cluster knowledge system.
3. The extra-cluster knowledge system.
4. The innovation system.

We measured cluster innovation capacity as the average of the values attributed to each of these four items.

3.4. Openness

The goal of this dimension is to classify the openness of clusters based on their:

1. *Export orientation*: absent, low, growing, medium, or high.
2. *Presence of MNCs* (foreign and local) in the cluster: *yes* or *no*.
3. Cluster firm *participation in GVCs*: *yes* or *no*.

Based on this information, we classified clusters as:

- *Closed*: No or weak evidence of the cluster being connected to international actors. Closed clusters have no or very low export orientation, no MNCs, and their firms do not participate in a GVC.
- *Closed-Opening*: Evidence of the cluster starting to be connected to international actors, growing export orientation, but no MNCs, nor GVC participation of cluster firms.
- *Semi-Open*: Medium to high export orientation and some evidence of the cluster being moderately connected to international actors.
- *Open*: Evidence of the cluster being strongly connected to international actors, medium to high export orientation, and clusters either host an MNC or their firms participate in GVCs or both.

3.5. Stages of the Cluster Life Cycle

We considered the three following sub-dimensions:

1. *Size*: Number of actors involved.
2. *System characteristics*: Degree of joint action.
3. *Networks and external knowledge*: Existence of open networks and channels to access external knowledge (see innovation capacity).

Adapting from Menzel and Fornahl (2010), based on these two sub-dimensions and considering the historical information available, we identified four stages of the cluster life cycle:

1. Emerging:
 - Small number of actors
 - Low or low/medium joint action
 - Semi-open knowledge networks
2. Growing:
 - Increasing number of actors
 - Medium or high joint action
 - Open knowledge networks
3. Sustaining:
 - Large number of actors
 - Medium or high joint action
 - Open or semi-open knowledge networks

4. Declining:
- Large number of actors
 - Low or low/medium joint action
 - Closed knowledge networks

3.6. The Role of Policies

In this dimension, we classified clusters on the basis of whether their formation or development was promoted by policy interventions:

- *Spontaneous cluster*: No sign of policies to establish or develop the cluster.
- *Cluster with policy from inception*: Set up from scratch through policy interventions (either by the State or by other international organization).
- *Cluster with policy for development*: Process supported by cluster policies.

Table 3.1: Measuring Cluster Dimensions

Dimension	Measure	Synthetic Indicator
Cluster Structure		
• Sectoral specialization	Qualitative	
• Geographical boundaries	Qualitative	
• Organizational structure	Qualitative	
Collective Efficiency		
• External economies	Low, Low/Medium, Medium, Medium/High, High	Average Value
• Joint action		
Innovation Capacity		
• Knowledge and technological base	Low, Low/Medium, Medium, Medium/High, High	Average Value
• Intra-cluster knowledge system		
• Extra-cluster knowledge system		
• Innovation system		
Openness		
• Export orientation	Absent, Low, Growing, Medium, High	Closed, Closed-Opening, Semi-Open, Open
• Presence of MNCs	Yes, No	
• Participation in GVCs	Yes, No	
Stage of Life Cycle		
• Size	# of actors involved	Emerging, Growing, Sustaining, Declining
• System characteristics	Degree of joint action (see Section 2.3: Collective Efficiency)	
• Networks and external knowledge	Existence of open networks and channels to access external knowledge (see Section 2.5: Openness)	
Policies		
• Spontaneous cluster	Yes, No	
• Inception policies	Yes, No	
• Development policies	Yes, No	

4. The Caribbean Clusters

Based on the key cluster dimensions discussed in *Section 2: The Main Features of Clusters* and operationalized in *Section 3: Classifying Clusters*, we provide an overview of the main characteristics of the 32 Caribbean clusters surveyed for this paper. Table 4.1 provides a summary of the cluster characteristics. Appendix 1 provides a list of all the documents reviewed and on which the empirical analysis was based.

4.1. Cluster Structure

Table 4.1 presents the classification of the Caribbean clusters according to three dimensions: their sector of specialization, their geographical boundaries, and their organizational structure.

4.1.1. Sectoral specialization.

The *sectoral* dimension of the clusters reflects the dominant economic structure of the Caribbean region and is characterized by the predominance of the tertiary industry and by exploitation of natural resources, with only two clusters exclusively specialized in manufacturing.

Clusters in the tertiary industry mainly specialize in tourism, often exploiting local natural resources. For example, in Guyana eco-tourism clusters are targeting new market niches such as bird watching and catch and release fishing, while in Grenada there is a geo-tourism cluster. Besides tourism, there are creative industries clusters in the region that exploit the rich cultural heritage in music, visual arts, and popular traditions, such as Carnival in Trinidad and Tobago. Attempts to build new creative specializations, such as animation in Barbados, Jamaica, and Saint Lucia, are also worth mentioning. They represent an attempt to establish clusters involving different forms of creative activities. A case in point is the creation of a multimedia center in Barbados. Finally, the tertiary industry also includes a number of clusters operating in financial and business services, as well as in maritime services.

Natural resource based clusters are numerous and include agricultural products, such as nutmeg production in Grenada; non-traditional products, such as fruits and vegetables in Guyana; and agro-processing, such as coconut water in Guyana and processed food in Trinidad and Tobago. It is also worth mentioning a forest products cluster in Guyana, where firms specialize in producing floors, decks, furniture, and other wood products. Moreover, we identified a set of clusters specialized in aquaculture, such as fish farming in Guyana, shrimp breeding in Belize, and ornamental fish in Jamaica. Finally, two key natural resource-based clusters in Trinidad and Tobago focus on oil and gas production and related services and manufacturing activities.

Table 4.1: Caribbean Clusters: The Main Dimensions

Clusters	Geographical Boundaries	Cluster Organization	Collective Efficiency		Innovation Capacity	Openness	Stage of Life Cycle	Cluster Policy
			EE	JA				
Natural Resource Based								
Agriculture								
• Guyana (non-traditional agriculture)	N	H&S	M	M/H	M	O	G	I
• Grenada (nutmeg)	N	M	L/M	M	L/M	S-O	G	S
• T&T (agro products in Felicity)	L	M	M	M/H	L/M	C	G	I/D
• T&T (agro products in Jerningham)	L	M	M	L/M	L/M	C	G	I
Agro-processing								
• Guyana (coconut water)	L & I-C	H&S	M	H	L/M	O	G	D
• T&T (food sustainability)	N	M	H	H	M	C	G	D
Forestry								
• Guyana (wood products)	N	M	L/M	L	M	O	G	D
Aquaculture								
• Guyana (aquaculture)	N	M	M	M/H	M/H	C/O	G	I/D
• Belize (shrimp)	N	M	H	M/H	M	S-O	G	D
• Jamaica (ornamental fish)	U	H&S	M	M/H	M	S-O	E	S/D
Energy								
• T&T (oil and gas products and services)	N	M	H	H	H	O	S	S/D
• T&T (Point Lisas Industrial Estate)	L	M	H	M/H	M/H	O	G	I/D
Manufacturing								
• Guyana (gold jewelry)	N	M	M	L	L/M	C	S	S
• Various countries (rum)	I-C	M	L/M	H	M	O	S	D
Services								
Tourism								
• Guyana (fishing in North Rupunini)	L	M	L	H	L	S-O	G	I
• Guyana (birding)	N	M	M	M	M	O	E	I
• T&T (tourism in Carapichaima)	L	M	L/M	L	L/M	C/O	E	D
• T&T (tourism)	N	M	M	L/M	L	S-O	S	D
• Jamaica (Treasure Beach)	L	M	L/M	M/H	L	S-O	E	S/D
• Grenada (geo-tourism)	N	M	L	M	M	O	G	D
• Suriname (Upper Suriname River Area)	L	M	M	M	L/M	S-O	E	S/D
Creative Industries								
• Various countries (animation)	I-C	M	L/M	M	L/G	C/O	E	D
• Barbados (multimedia)	N	H&S	M	M/H	M/G	O	E	S
• T&T (music, film, Carnival)	N	M	H	M	H	O	G	D
	L	S	L	M	L	C	D	S

Clusters	Geographical Boundaries	Cluster Organization	Collective Efficiency		Innovation Capacity	Openness	Stage of Life Cycle	Cluster Policy
			EE	JA				
• T&T (pottery)								
Other Services								
• T&T (maritime services)	N	M	M	H	H	S-O	G	D
• T&T (financial services)	U	M	H	M/H	H	O	S	D
• T&T (business services)	U	M	H	L/M	H	S-O	G	S
• T&T (retail)	U	M	M	M/H	L	C	S	S
• Jamaica (ICT/business services)	N	M	H	M/H	M/H	S-O	G	S/D
• Jamaica (printing and packaging)	N	M	M	M	M/H	S-O	G	S/D
• Various countries (maritime services)	I-C	H&S	M	M	M	O	G	D

Notes:

Geographical Boundaries: L = Local, U = Urban, N = National, I-C = Inter-Caribbean.

Cluster Organization: S = Survival, M = Marshallian, H&S = Hub-and-spoke.

Collective Efficiency: EE = external economies, JA = joint action; L = Low, L/H = Low/Medium, M = Medium, M/H = Medium/High, H = High.

Innovation Capacity: L = Low, L/H = Low/Medium, M = Medium, M/H = Medium/High, H = High.

Openness: C = Closed, C-O = Closed-Opening, S-O = Semi-Open, O = Open.

Stage of Life Cycle: E = Emerging, G = Growing, S = Sustaining, D = Declining.

Specialization in manufacturing goods is not common among Caribbean clusters. We included only two manufacturing clusters: gold jewelry in gold rich Guyana, and rum production in most Caribbean countries.⁵

4.1.2. *Geographical boundaries.*

Given the very small and insular dimension of Caribbean countries, half of the clusters considered for this paper were classified as having *national* boundaries, involving economic actors and institutions located in different parts of the same country. The *local* dimension was predominant in agricultural clusters (for the territorial nature of specific crops), as well as in tourism—with some promotion of subnational areas, such as the Upper Suriname River Region in Suriname and Treasure Beach in Jamaica. The pottery cluster, which aggregates micro and small artisanal firms in Trinidad and Tobago, was also classified as subnational.

Service industry clusters, including financial, business, and retail services in Trinidad and Tobago, were classified as *urban*. In Jamaica, a cluster specialized in breeding ornamental fish is also considered *urban*.

Finally, we expected a wide diffusion of inter-country clusters, as the Caribbean and its member countries are small and the economic systems likely cannot guarantee scale economies for cluster firms. Nevertheless, limited cooperation and a lack of inter-regional economic linkages is one the key problems in the region, which is reflected in the small number of inter-Caribbean clusters we found for this study. Production of coconut water involving small producers in Guyana and a large agro-processing firm in Trinidad and Tobago was among the inter-Caribbean clusters. Also, rum is produced in most Caribbean countries and there is an inter-Caribbean cluster of small local producers, large multinationals, local business associations, and service providers. There is also a cluster specialized in maritime services that includes firms in Saint Lucia, Dominica, St. Vincent and the Grenadines, and Grenada. Finally, there is a cluster in the animation industry with studios in Barbados, Jamaica, and Saint Lucia.

4.1.3. *Organizational structure.*

In terms of organizational structure, we distinguished between survival, Marshallian, and hub-and-spoke clusters. The most common organizational structure across sectors and countries is the Marshallian cluster, characterized by firms of different sizes (although they are mostly small) and by local input producers, service providers, and supporting institutions. The Marshallian clusters in our study, which were usually characterized by intense EEs and diffuse joint action, were very diverse and rather different from the typical Marshallian cluster in advanced countries. Among the clusters investigated, there were cases with a very small number of economic actors, such as the catch and release fishing cluster in Guyana where there are only a few lodges, one tour operator, and a small group of supporting organizations and service providers. Other clusters were more complex, involving a larger number of organizations, such as oil and gas production in Trinidad and Tobago, where firms operated at different stages of the value

⁵ We are aware of other manufacturing clusters (OTF Group, 2010) but the information available is not sufficient to include them in this analysis.

chain, from exploring for and extracting oil, to manufacturing petrochemical products and providing specialized services. Moreover, business associations and several public agencies provide support to this cluster. There were also clusters with Marshallian characteristics and elements of a hub-and-spoke structure. This is the case for a large forestry cluster in Guyana, which has many small and medium companies operating like in a Marshallian cluster working alongside a hub firm—a large Malaysian MNC—connecting local producers to external markets. To simplify classification, we classified this cluster as Marshallian, but in the analysis we keep in mind the presence of hybrid organizational models.

The coconut water cluster in Guyana is a hub-and-spoke model, with many small farmers and a few larger farms selling coconuts to three processing plants, one being a large company from Trinidad and Tobago that plays a leading role in the cluster. A similar organizational structure characterizes a fruit and vegetable producing cluster in Guyana which has an Israeli company acting as a hub and organizing the production and export activities of the local farmers. In the ornamental fish cluster in Jamaica, the hub is an NGO connecting the breeders and growers to external markets and providing specialized services, such as managing quality and traceability, marketing, packaging, and shipping, as well as advocating for the small producers. In Barbados, the hub is a multimedia center playing the role of distributor agency and promoting different local creative activities in audiovisuals, fashion, music, visual arts, publishing, and culinary art. In the large and complex inter-Caribbean cluster specialized in maritime services, there are two very different components. A few large international shipping lines providing services from the United States and Europe to their regional hubs in Barbados and Trinidad dominate one part of the cluster. On the other islands, the cluster is in survival because it is composed of largely informal, small vessels that ply their trade within the Caribbean islands. This is another hybrid organizational structure, but in this analysis we classified the cluster as hub-and-spoke based on the dominant pattern.

Finally, only one cluster was classified as survival—the pottery cluster in Trinidad and Tobago, which is composed of a bunch of small artisanal firms, many of them informal and mainly producing for the local market. It is worth mentioning that in developing countries survival clusters are very common and the reason we found only one in our sample is likely because such clusters often subsist below the radar of policymakers and researchers.

4.2. Collective Efficiency

Table 4.2 presents the detailed information available on the different elements of collective efficiency in the clusters investigated in this study.

4.2.1. External economies.

External economies are the first component of collective efficiency. We assessed their presence in the availability of qualified labor resources, the easy accessibility of inputs, access to information, and access to market.

Qualified Labor Resources. In the clusters investigated, the quality of the local labor market was very diverse. Clusters specialized in energy, financial, business, and maritime services in

Trinidad and Tobago and in Jamaica benefited from a very good local availability of skilled resources thanks to specialized master degrees at the local universities and to public programs aimed at training young people in the required competences. In contrast, the labor market in the part of the maritime cluster dominated by small informal vessels and involving the small island countries of Saint Lucia, Dominica, St. Vincent and the Grenadines, and Grenada, displayed a severe lack of qualified human resources. In this cluster, the vast majority of vessel crews received very limited formal training in key areas such as seafaring and business administration. A survey of the cluster conducted in 2010 found that approximately 80 percent of the crewmen on the vessels inspected had not completed a basic safety training course, which is required to comply with the Standards of Training and Certification within the Watch-keepers (STCW) Convention.

There are several other clusters in sectors such as agriculture, manufacturing, and tourism with low levels of qualified labor resources. Two cases—the birding cluster in Guyana and the animation cluster in Barbados, Jamaica, and Saint Lucia—show how developing a competent and qualified local labor force can become a key resource for cluster growth. In Guyana, Guyana Trade and Investment Support, a USAID-funded program, has trained local people in bird watching, eco-tourism, and indigenous best practices, creating a critical mass of skilled local human resources, key for Guyana’s entry into this new segment of the tourism market. For the animation cluster, government agencies and training institutions in Barbados and Jamaica are investing in building up competences and several educational institutions are developing specialized curriculums to provide advanced qualification in the field.

Input Availability. Input availability is key in natural resource clusters, like those specialized in the energy industry in Trinidad and Tobago and those in aquaculture in Guyana, Belize, and Jamaica. In the shrimp cluster in Belize, well-run local hatcheries for the post-larvae phase are considered a key competitive advantage in the local industry. Similarly, in producing ornamental fish in Jamaica, the local availability of inputs such as feed, chemicals, and packaging products represents an important element of competitiveness. While in some clusters input availability is a strength, there are other cases where bad infrastructure limits the accessibility of cluster firms to inputs. A case in point is the nutmeg cluster in Grenada, where poor port facilities mean many farms may remain inaccessible for long periods of time after hurricanes. Similarly, in Treasure Beach, Jamaica, roads are in poor condition and the water supply is often unreliable and inadequate. In the inter-Caribbean maritime cluster, the limited availability of key inputs constrains cluster development. The cluster has inadequate warehousing and a lack of refrigeration capacity on ships and in warehouses, and inadequate specialized services, such as insurance and cargo handling.

Availability of inputs is limited for clusters for which the majority of raw materials and components are imported and that are affected by world market price fluctuations. Jamaica’s paper and packaging cluster has inputs such as paper, resin, and ink that are all imported. Importers are unable to buffer fluctuations or negotiate better prices because their individual quantities are often too small.

Table 4.2: Caribbean Clusters: Collective Efficiency

Clusters	External Economies				Joint Action		
	Labor Market	Inputs	Information	Market Access	Vertical Back/For	Horizontal Bilateral	Multilateral
Natural Resource Based							
Agriculture							
• Guyana (non-traditional agriculture)	M	M	NA	M	H	NA	M
• Grenada (nutmeg)	M	L	L	M	L	H	M
• T&T (agro products in Felicity)	L	M	H	H	M	NA	H
• T&T (agro products in Jerningham)	L	M	H	H	L	NA	M
Agro-processing							
• Guyana (coconut water)	M	L	NA	H	H	H	M
• T&T (food sustainability)	H	H	H	H	H	NA	H
Forestry							
• Guyana (forestry and wood products)	M	M	L	L	NA	L	H
Aquaculture							
• Guyana (aquaculture)	M	M	M	L	M	NA	H
• Belize (shrimp)	H	H	H	M	H	M	H
• Jamaica (ornamental fish)	L/M	H	M	H	H	M	M
Energy							
• T&T (oil and gas production and services)	H	H	H	H	H	NA	H
• T&T (Point Lisas Industrial Estate)	H	H	H	NA	NA	M	H
Manufacturing							
• Guyana (gold jewelry)	L	M	NA	M	NA	NA	L
• Various countries (rum)	L	L	M	H	M/H	H	H
Services							
Tourism							
• Guyana (fishing in North Rupunini)	L	L	L	L	H	H	H
• Guyana (birding)	M	NA	NA	M	M	NA	M
• T&T (tourism in Carapichaima)	L	L	M	M	L	NA	L
• T&T (tourism)	H	H	L	M	L	L	M
• Jamaica (Treasure Beach)	L	L	M	M	M	H	H
• Grenada (geo-tourism)	L	M	L	L	L	H	H
• Suriname (Upper Suriname River Area)	M	M	M	M	M	L	M/H
Creative Industries							
• Various countries (animation)	L/M	L/M	L/M	M	M	M	M
• Barbados (multimedia)	M	M	L/M	L/M	M/H	NA	M/H
• T&T (music, film, Carnival)	H	M	H	H	M	L/H	M
• T&T (pottery)	L	L	NA	M	NA	NA	M
Other Services							
• T&T (maritime services)	H	L	NA	H	H	NA	H
• T&T (financial services)	H	H	NA	H	M	NA	H
• T&T (business services)	H	M	H	NA	L	NA	M

Clusters	External Economies				Joint Action		
	Labor Market	Inputs	Information	Market Access	Vertical Back/For	Horizontal Bilateral	Multilateral
• T&T (Retail)	M	L	M	H	M	L/M	L/M
• Jamaica (ICT/business services)	H	H	NA	NA	H	M	H
• Jamaica (printing and packaging)	L/M	L	M	H	H	NA	M
• Various countries (maritime services)	L	L	NA	H	L	NA	M/H

Notes: NA = not available, L = Low, L/H = Low/Medium, M = Medium, M/H = Medium/High, H = High.

Information. In general, information sharing within the investigated clusters was very good. For instance, in the shrimp cluster in Belize, information circulates thanks to frequent visits and contacts of small local farms to larger companies and, in some instances, farms lend each other specialized employees. Labor mobility is key to accessing specialized information in a number of clusters, including the printing and publishing cluster in Jamaica.

Market Access. The poor infrastructure in many clusters in the region is an obstacle to growth, nullifying advantages from clustering. In a number of cases—such as in the non-traditional agricultural clusters in Guyana and in the Upper Suriname River Area cluster—recent road improvements allowed improved market access. However, in the latter cluster, local companies complained because they are unable to take advantage of the cluster effect, given that most still promote their individual lodges instead of internationally marketing the cluster.

4.2.2. Joint action.

In clusters, joint action takes place along backward and forward vertical linkages, bilateral horizontal links between companies, and multilateral linkages within business associations and other supporting institutions.

Backward and Forward Vertical Linkages. In Guyana’s non-traditional agricultural products cluster, vertical linkages are very well developed, particularly in logistics. Some farmers are located in remote areas. Through joint action, the cluster addressed transportation and logistics obstacles, including the high cost of refrigerated containers, through a partnership with a Caribbean-based cargo company interested in growing its refrigerated container business. Because of this collaboration, the company has agreed to charge the farms in the cluster the rates typically reserved for high-volume business. Also, collaboration with a regional freight company resulted in the construction of a cold storage facility for fresh fruit and vegetable exports. The aquaculture cluster also uses this facility, making an interesting case of inter-cluster collaboration.

Guyana’s coconut water cluster cooperates between the hub processing company and the spoke coconut producers. The leading company offers technical support to farmers and donates key equipment and, in some cases, has provided financial support through cash advances and guaranteed remunerative prices. In exchange for this wide support, the farmers invest in

upgrading the quality of their products. Another example of vertical joint action is the shrimp cluster in Belize where firms with hatcheries and processing facilities cooperate with those that do not have such facilities.

Barbados' creative cluster has strong vertical linkages among cluster firms, cooperating on large projects on the basis of different specializations. For instance, a company producing a music video may collaborate with production houses, dancers, and designers; hire a historic location; and use the services of a publishing company to produce promotional material. In co-production, cluster firms may co-fund projects, sharing the risk and the responsibility on the basis of the amount of capital invested.

Horizontal Bilateral Linkages. In the non-traditional agricultural cluster, there is an interesting case of horizontal bilateral collaboration between some small farms and the leading Israeli company, which provides training in up-to-date cultivation techniques and farm management to improve the quality and quantity of yields. These farmers can combine their limited production with the larger volumes produced by the hub company, exporting to international markets.

Guyana's coconut water cluster shows horizontal cooperation, with coconut producers working together on key tasks such as sharing the same harvesting teams. In Belize, the shrimp farms regularly share materials, such as ice, hairnets, and chemicals.

Bilateral collaboration is facilitated by the high level of trust among local actors. The main actors in the catch and release tourism cluster in Guyana have a long tradition of collaboration and the cluster was created based on the positive experience of some lodges having worked together for a long time. The different lodges offer diversified experiences (i.e., savanna, wetlands, and rain forest) and therefore they offer packages to tourists including overnight stays in each lodge. This experience contrasts with the Upper Suriname River Area cluster where there is no tradition of collaboration and the low degree of collective action is a key constraint to the cluster's competitiveness. One of the major complaints in the River Area cluster is that there is no joint promotion of the area or of the local Maroon culture. Local entrepreneurs pursue individual strategies when they sell in international markets. Given the remoteness of the area and the associated high transportation costs, the lack of coordination among lodges impacts prices, which are therefore extremely high and potentially not competitive. The lack of coordination on scheduling, as well as the absence of collaboration on transportation and sharing other costs are a constraint to further development of the cluster.

Multilateral Cooperation. Multilateral cooperation is particularly pronounced in the aquaculture clusters. In all the three clusters analyzed for this paper, the need to address the environmental impact of aquaculture has pushed cluster firms to cooperate multilaterally. In Belize, the establishment of an association involving all the operating farms has been key to promoting the successful adoption of environmental standards in shrimp production and to addressing the many environmental challenges involved in fulfilling international standards. A similar role is played by the National Aquaculture Association of Guyana, which provides technical support to farmers, plays a key role in the policy dialogue between the industry and the government, and guides the strategic planning of this emerging industry.

Another industry affected by environmental issues is forestry. In Guyana, the Guyana Forestry Commission plays a key role in establishing control over the forestry industry by collaborating with the Amerindian population and private companies, and by providing training services and marketing support.

In Grenada's tourism cluster, a key role of multilateral cooperation is joint procurement of energy, as the high costs of energy are one of the major barriers to the sector's growth and competitiveness. Grenada's Hotel and Tourist Association is a non-profit organization that represents the private sector within the island's tourism sector. The association has set up a project, funded by the Caribbean Development Fund, to jointly procure LED lights and solar panels and to promote an energy audit to identify the quantity required by each company. The association also provides educational opportunities for industry workers and assists private actors in developing cultural activities and joint marketing initiatives.

A final consideration concerning multilateral joint action comes from the inter-Caribbean rum cluster where cooperation among companies, associations, and institutions in the different countries is clearly hampered by language differences. The West Indies Rum and Spirits Producers' Association, a regional association of distilleries, was founded in the late 1960s by rum producers in larger English-speaking countries. It expanded gradually to encompass other Caribbean countries and finally also the Dominican Republic and Haiti. The Dominican producers have traditionally cooperated more with companies in Spanish-speaking Central America and there is no cooperation between producers in the Dominican Republic and in Haiti, despite being located on the same island. The association provides technical expertise and information about international trade rules.

4.3. Innovation Capacity

Table 4.3 summarizes the empirical evidence about the innovation capacity of the Caribbean clusters studied. The first two columns present an assessment of the knowledge base of the cluster firms and the development of the intra-cluster knowledge system. Among the clusters with a high knowledge base and a dense knowledge system, there are the two energy clusters and those specialized in maritime, creative, business, and financial services, all located in Trinidad and Tobago. These clusters all have a skilled labor force and include a variety of companies with high capacity for knowledge and innovation embedded in the local knowledge system. The companies in the clusters interact with universities and public institutions and include active industry associations.

Jamaica's printing and publishing cluster has a medium knowledge base but the intra-cluster knowledge flows are very dense thanks to high labor mobility among firms. Attracting experienced workers from well-established companies in the cluster, young and dynamic firms are able to rapidly improve their production processes. Labor mobility is also considered a major driver of the intra-cluster knowledge system in the shrimp cluster in Belize, which is characterized, as are the other clusters in the aquaculture industry, by a medium knowledge base.

In agriculture and tourism there are a few clusters with a weak knowledge base and relatively unskilled human resources. Other weak clusters are those specialized in pottery and retail in Trinidad and Tobago. In these clusters, there are no leading firms that facilitate knowledge access to smaller firms and the local innovation system is relatively underdeveloped.

Channels through which clusters are interconnected with non-local, external knowledge are a key component in their innovation capacity (Column 3 in Table 4.3). Clusters can tap into external knowledge sources through their hub companies. Guyana's non-traditional agricultural cluster includes an Israeli company that plays this role through important local investment. Similarly, in Guyana's forestry cluster, international investors provide key technical assistance and access to knowledge, so local companies can improve their production practices and meet international quality standards. Accessing knowledge through international companies also occurs in the regional rum cluster and in the coconut water cluster in Guyana.

Table 4.3: Caribbean Clusters: Innovation Capacity

Clusters	Knowledge Base	Intra-cluster Knowledge	Extra-cluster Knowledge	Innovation System	Innovation Capacity
Natural Resource Based					
Agriculture					
• Guyana (non-traditional agriculture)	M	M	H	M	M
• Grenada (nutmeg)	M	M	L	L	L/M
• T&T (agro products in Felicity)	L	M	M	L	L/M
• T&T (agro products in Jerningham)	L	M	M	L	L/M
Agro-processing					
• Guyana (coconut water)	L	L	M	M	L/M
• T&T (food sustainability)	M	M	NA	H	M
Forestry					
• Guyana (forestry and wood products)	M	M	M	H	M
Aquaculture					
• Guyana (aquaculture)	M	M	H	H	M/H
• Belize (shrimp)	M	M	M	M	M
• Jamaica (ornamental fish)	M	M	M	H	M
Energy					
• T&T (oil and gas prod and services)	H	H	H	M	H
• T&T (Point Lisas Industrial Estate)	H	H	M	M	M/H
Manufacturing					
• Guyana (gold jewelry)	M	M	L	L	L/M
• Various countries (rum)	M	L	M	M	M
Services					
Tourism					
• Guyana (fishing in North Rupunini)	L	L	M	L	L
• Guyana (birding)	M	M	M	L	M
• T&T (tourism in Carapichaima)			L	M	L/M
• T&T (tourism)	L	L	M	NA	L
• Jamaica (Treasure Beach)	L	L	L	L	L
• Grenada (geo-tourism)	L	L	H	H	M

	Knowledge Base	Intra-cluster Knowledge	Extra-cluster Knowledge	Innovation System	Innovation Capacity
Clusters					
• Suriname (Upper Suriname River Area)	M	M	L	L	L/M
Creative Industries					
• Various countries (animation)	L/G	L/G	L	M	L/H
• Barbados (multimedia)	M	M	M/H	M/H	M/H
• T&T (music, film, Carnival)	H	H	M	H	H
• T&T (pottery)	L	L	L	L	L
Other Services					
• T&T (maritime services)	H	H	H	H	H
• T&T (financial services)	H	H	H	NA	H
• T&T (business services)	H	H	NA	NA	H
• T&T (retail)	L	M	L	L	L
• Jamaica (ICT/business services)	M	M	H	H	M/H
• Jamaica (printing and packaging)	M	H	M	H	M/H
• Various countries (maritime services)	L	L	H	M	M

Notes: L = Low, L/H = Low/Medium, M = Medium, M/H = Medium/High, H = High.

The shrimp cluster in Belize is externally connected through its involvement in a GVC. Belize shrimp growers are, collectively, a small player in the international shrimp market and thus are therefore not suited to serve the giant retail distributors of the major markets. However, they have managed to enter a relatively small Canadian value chain, which requires them to obtain standard certifications—a key incentive for innovation in the cluster. To meet the necessary standards, the national industry association has very actively promoted participation of local shrimp producers in international conventions and trade fairs. These events have been critical to developing the cluster, since they have facilitated the local diffusion of information about marketing and about adopting international best practices.

Jamaica's printing and publishing cluster has a group of 10 to 15 leading companies locally that are knowledgeable about new technologies and product development. These firms have developed strong linkages with foreign equipment manufacturers and technicians, who often offer them valuable training in process and product R&D. Similarly, Grenada's tourism cluster has accessed external knowledge by acquiring world class technical expertise, especially in branding, marketing, social media, and eco-tourism.

Column 4 in Table 4.3 assesses the degree of development of the cluster's innovation system. Guyana's forestry cluster has a very well developed innovation system orchestrated by the Guyana Forestry Commission with the assistance of a number of international donors. There is a national technical institute that provides specialized training for the workforce and also does research in the areas requested by the local industry. Guyana's forestry cluster is also involved in international forest ecology research, largely undertaken by Trobenbos, a Dutch NGO with a focus on nature management and conservation.

The three aquaculture clusters also have well-developed innovation systems, with supporting institutions that help with managing environmental issues, which is key for the survival and growth of the industry. In the three clusters, collaboration among the relevant stakeholders along all levels of the supply chain is an important condition to developing and implementing industry-wide environmental and social standards, and to eliminating the negative effects of fish farming. The active collaboration among companies, industry associations, and relevant ministries is also important in promoting a legal framework that respects the environment and regulates the use of natural resources. In Jamaica, to improve data accessibility, there is a system that combines mobile, web, and GPS technologies to collect, manage, and store information about fish stocks (species, variety and size) across the cluster.

4.4. Openness

The openness of the Caribbean clusters is assessed based on three different dimensions: *export orientation*, *the presence of MNCs*, and *cluster involvement in GVCs*. The available empirical evidence for the cases investigated is summarized in Table 4.4.

Table 4.4: Caribbean Clusters: Openness

Clusters	Export Orientation	MNCs	GVCs	Openness
Natural Resource Based				
Agriculture				
• Guyana (non-traditional agriculture)	H	Yes	Yes	Open
• Grenada (nutmeg)	H	No	No	Semi-Open
• T&T (agro products in Felicity)	L	No	No	Closed
• T&T (agro products in Jerningham)	A	No	No	Closed
Agro-processing				
• Guyana (coconut water)	H	Yes	Yes	Open
• T&T (food sustainability)	L	No	No	Closed
Forestry				
• Guyana (forestry and wood products)	H	Yes	Yes	Open
Aquaculture				
• Guyana (aquaculture)	G	No	No	Closed-Opening
• Belize (shrimp)	H	No	No	Semi-open
• Jamaica (ornamental fish)	M	No	No	Semi-open
Energy				
• T&T (oil and gas prod and services)	H	Yes	Yes	Open
• T&T (Point Lisas Industrial Estate)	H	Yes	Yes	Open
Manufacturing				
• Guyana (gold jewelry)	L	No	No	Closed
• Various countries (rum)	H	Yes	Yes	Open
Services				
Tourism				
• Guyana (fishing in North Rupunini)	H	No	No	Semi-Open
• Guyana (birding)	H	No	Yes	Open
• T&T (tourism in Carapichaima)	G	No	No	Closed-Opening
• T&T (tourism)	M	No	No	Semi-Open
• Jamaica (Treasure Beach)	M	No	Yes	Semi-Open

Clusters	Export Orientation	MNCs	GVCs	Openness
• Grenada (geo-tourism)	H	Yes	No	Open
• Suriname (Upper Suriname River Area)	M	Yes	No	Semi-Open
Creative Industries				
• Various countries (animation)	G	No	No	Closed-Opening
• Barbados (multimedia)	G	No	Yes	Open
• T&T (music, film, Carnival)	G	No	Yes	Open
• T&T (pottery)	None	No	No	Closed
Other Services				
• T&T (maritime services)	H	No	No	Semi-Open
• T&T (financial services)	H	Yes	No	Open
• T&T (business services)	H	No	No	Semi-Open
• T&T (retail)	A	No	No	Closed
• Jamaica (ICT/business services)	M	No	Yes	Semi-Open
• Jamaica (printing and packaging)	Indirect exports	No	Yes	Semi-Open
• Various countries (maritime services)	H	Yes	Yes	Open

Notes:

Export orientation: A = Absent, L = Low, G = Growing, M = Medium, H = High.

Importantly, the export orientation of the clusters specialized in agriculture depends on the local presence of MNCs and/or their involvement in GVCs. Among the agricultural clusters, Guyana's non-traditional agriculture cluster has high export orientation thanks to a large investment by its Israeli hub firm, which provides training, packaging, and storage services to small local producers. Collectively, these local producers achieve the critical volumes required to fill large export orders. Similarly, in the coconut water cluster, the foreign market (i.e., mainly Trinidad and Tobago and other Caribbean islands) is reached thanks to a processing company based in Trinidad that controls important distribution networks abroad.

An analogous pattern can be identified in Guyana's forestry cluster and the regional rum cluster where there are several MNCs. In both clusters, export orientation increased thanks to joint ventures between foreign and local companies or the acquisition of local firms by foreign MNCs, such as two rum companies in Barbados and the Dominican Republic. Access to an MNCs international distribution networks results in a large increase in export sales.

In the creative industry, a GVC led by an MNC can represent a key channel to open a cluster to external knowledge and other valuable assets. This is the case for the cluster in Barbados, which collaborated with Sony Pictures to develop a documentary series and the first Caribbean 3D movie.

In tourism clusters, openness depends on international tour operators. In the recently established bird watching cluster in Guyana, 40 international tour operators have attracted a critical mass of international tourists in a very specialized market niche. Suriname's tourism cluster shows a different pattern, with local tour operators having sales offices in the Netherlands, which is by far Suriname's most important tourism market.

The international market for Trinidad and Tobago’s maritime, financial, and business services clusters is mainly regional, with local companies seen as providing the best and most advanced services. In maritime services, Trinidad and Tobago has evolved into a regional shipment hub offering services to the smaller islands in the region. Similarly, in financial services, Trinidad and Tobago is considered the financial capital of the region, where many companies come to raise capital in both the bond and equity markets.

4.5. Stages of the Life Cycle

Table 4.5 summarizes our classification of clusters according to their stages of the life cycle.

Table 4.5: Caribbean Clusters: Stages of the Life Cycle

Clusters	Direct:	Systemic:		Stage of Life Cycle
	# of Actors	Joint Action	Open Knowledge Networks	
Natural Resource Based				
Agriculture				
• Guyana (non-traditional agriculture)	Increasing	H	H	Growing
• Grenada (nutmeg)	Large	M	L	Growing
• T&T (agro products in Felicity)	Increasing	M	M	Growing
• T&T (agro products in Jerningham)	Increasing	L/M	M	Growing
Agro-processing				
• Guyana (coconut water)	Increasing	H	M	Growing
• T&T (food sustainability)	Increasing	H	NA	Growing
Forestry				
• Guyana (forestry and wood products)	Increasing	M	M	Growing
Aquaculture				
• Guyana (aquaculture)	Increasing	M/H	H	Growing
• Belize (shrimp)	Increasing	M/H	M	Growing
• Jamaica (ornamental fish)	Small	M	M	Emerging
Energy				
• T&T (oil and gas prod and services)	Large	H	H	Sustaining
• T&T (Point Lisas Industrial Estate)	Increasing	M/H	M	Growing
Manufacturing				
• Guyana (gold jewelry)	Large	L	L	Sustaining
• Various countries (rum)	Large	H	M	Sustaining
Services				
Tourism				
• Guyana (fishing in North Rupunini)	Increasing	H	M	Growing
• Guyana (birding)	Small	M	M	Emerging
• T&T (tourism in Carapichaima)	Small	L	L	Emerging
• T&T (tourism)	Large	M	M	Sustaining
• Jamaica (Treasure Beach)	Small	M	L	Emerging
• Grenada (geo-tourism)	Increasing	H	H	Growing
• Suriname (Upper Suriname River Area)	Small	M	L	Emerging

Clusters	Direct:	Systemic:		Stage of Life Cycle
	# of Actors	Joint Action	Open Knowledge Networks	
Creative Industries				
• Various countries (animation)	Small	L/M	L	Emerging
• Barbados (multimedia)	Small	L/M	M	Emerging
• T&T (music, film, Carnival)	Increasing	M	M	Growing
• T&T (pottery)	Large	M	L	Declining
Other Services				
• T&T (maritime services)	Increasing	H	H	Growing
• T&T (financial services)	Large	H	H	Sustaining
• T&T (business services)	Increasing	L/M	NA	Growing
• T&T (retail)	Large	M	L	Sustaining
• Jamaica (ICT/business services)	Increasing	M	H	Growing
• Jamaica (printing and packaging)	Increasing	M	M	Growing
• Various countries (maritime services)	Large	M	H	Growing

Notes: L = Low, L/H = Low/Medium, M = Medium, M/H = Medium/High, H = High.

4.5.1. *Emerging clusters.*

We found evidence of many clusters in the emerging phase. Many were in the tourism industry, such as in Guyana, Suriname, Jamaica, and Trinidad and Tobago. These clusters entered new specialized market niches (e.g., bird watching in Guyana and other off-the-beaten-track locations like the Carapichaima cluster in Trinidad, Treasure Beach in Jamaica, and the Suriname Upper River Area). Emerging clusters are also often in the creative industry. The creative cluster in Barbados and the inter-Caribbean animation cluster developed very recently and are still in their emerging phase.

4.5.2. *Growing clusters.*

A large number of clusters are growing. All of the agricultural clusters and most of the aquaculture clusters (except the Jamaican cluster, which is still emerging) are in the growing phase.

4.5.3. *Sustaining clusters.*

The financial services cluster is in equilibrium, or in the sustaining phase in the terms of this paper. Other clusters, such as the energy cluster in Trinidad and Tobago and the inter-Caribbean rum production cluster, are well-established and specialize in traditional Caribbean industries, which can also be considered as sustaining.

4.5.4. *Declining clusters.*

Finally, the pottery cluster in Trinidad and Tobago is declining as a result of poor business operations, low technology, and very limited quality upgrading. This cluster is approximately 100 years old and has difficulty maintaining and improving local skills. Those skills are largely held by older members of the community and younger generations are not interested in the cluster activities because of the perceived lack of good market prospects.

4.6. Cluster Policies

Table 4.6: Caribbean Clusters: Role of Policies

Clusters	Spontaneous Cluster	Cluster with Policy for Inception	Cluster with Policy for Development
Natural Resource Based			
Agriculture <ul style="list-style-type: none"> • Guyana (non-traditional agriculture) • Grenada (nutmeg) • T&T (agro products in Felicity) • T&T (agro products in Jerningham) 	Yes	Yes Yes Yes	Yes
Agro-processing <ul style="list-style-type: none"> • Guyana (coconut water) • T&T (food sustainability) 			Yes Yes
Forestry <ul style="list-style-type: none"> • Guyana (forestry and wood products) 			Yes
Aquaculture <ul style="list-style-type: none"> • Guyana (aquaculture) • Belize (shrimp) • Jamaica (ornamental fish) 	Yes	Yes	Yes Yes Yes
Energy <ul style="list-style-type: none"> • T&T (oil and gas production and services) • T&T (Point Lisas Industrial Estate) 	Yes	Yes	Yes Yes
Manufacturing			
<ul style="list-style-type: none"> • Guyana (gold jewelry) • Various countries (rum) 	Yes		Yes
Services			
Tourism <ul style="list-style-type: none"> • Guyana (fishing in North Rupunini) • Guyana (birding) • T&T (tourism in Carapichaima) • T&T (tourism) • Jamaica (Treasure Beach) • Grenada (geo-tourism) • Suriname (Upper Suriname River Area) 	Yes Yes Yes Yes	Yes Yes	Yes Yes Yes Yes Yes
Creative Industries <ul style="list-style-type: none"> • Various countries (animation) • Barbados (multimedia) • T&T (music, film, Carnival) • T&T (pottery) 	Yes Yes	Yes	Yes Yes
Other Services <ul style="list-style-type: none"> • T&T (maritime services) • T&T (financial services) • T&T (business services) • T&T (retail) • Jamaica (ICT/business services) • Jamaica (printing and packaging) • Various countries (maritime services) 	Yes Yes Yes Yes Yes		Yes Yes Yes Yes Yes

4.6.1. *Spontaneous clusters.*

About 20 percent of the clusters analyzed for this paper were *spontaneous*, meaning that they emerged and further developed with no stimulation from specific cluster policies. Among the spontaneous clusters, gold jewelry production in Guyana is an agglomeration of mainly small companies whose growth is hampered by the lack of an adequate intellectual property protection policy. Unlike other Caribbean countries, Guyana has failed to enact such a policy and ensure compliance with it. This contextual obstacle is a deterrent to future growth in the cluster, with a critical mass of actors showing difficulties in their market positioning. Another spontaneous cluster that is declining as a result of a lack of policy is the pottery cluster in Trinidad and Tobago. Its origin can be traced back to Indian culture and the cluster has remained an agglomeration of small, often informal, artisanal activities with limited market opportunities and recent difficulty transferring tacit knowledge and artisanal skills to younger generations.

4.6.2. *Clusters with policy for development.*

Contrary to these two cases, there are spontaneous clusters that have been strengthened by policy interventions. An interesting case is the ornamental fish cluster in Jamaica, where ornamental fish farming dates back to the 1970s as an informal activity with very limited commercial opportunities. In the early 2000s, farmers attempted to launch an association to transform ornamental fish farming into a commercial venture. However, the association failed because of internal politics, poor quality production, and negative external conditions (i.e., several hurricanes caused great damages to the industry). In 2005, The Competitiveness Company (TCC) identified ornamental fish farming as an informal sector with great potential that could be transformed into an opportunity for urban youth and unemployed people to generate income. The policy that followed has promoted a set of pro-cluster activities, including training and building human capacity, developing a complex cluster of input suppliers and logistic services, and including new stages of the value chain, such as breeding and producing feed. A key policy component is environmental issues, introducing environmentally friendly best practices and compliance with international standards and health regulations. Technical expertise is provided to farmers to prepare them to export their products, respecting health standards and addressing challenges in packaging and shipping requirements. An interesting component of the cluster support program is exploring the feasibility and market opportunities for future diversification into exporting sea (salt water) ornamental fishes, invertebrates, coral, and live rocks to expand into a wider variety of aquatic products.

For some spontaneous clusters, policies have aimed to create a favorable business environment—several clusters in Trinidad and Tobago, the tourism clusters in Grenada and Suriname, the creative cluster in Barbados, and the business services cluster in Jamaica. Grenada provided international firms a tax holiday, made a national effort to promote a new image of the country as an eco-tourism destination, created a related marketing campaign to leverage the new brand internationally, and made an effort to moderate energy costs and airlift tariffs. In Suriname, the tourism cluster has benefited from infrastructure improvements and, very recently, from promotion of a cluster development initiative by the Ministry of Trade and Industry and the Suriname Business Forum (under the auspices of the IDB).

In Trinidad and Tobago, several clusters (food production, energy, tourism, maritime services, and financial services) receive support in ICT, education and training, infrastructure improvements (roads, utilities, air, and sea ports), and creating an environment favorable to business (e.g., regulations regarding intellectual property rights).

Among the interventions to support cluster development, a key role is played by those initiatives intended to build and strengthen external connections. A case in point is the coconut water cluster in Guyana. Compete Caribbean is supporting preparing a market development plan and exploring the feasibility of entering the organic and fair trade markets in order to diversify into a new value chain. In several clusters, the policies for development focus on opening external channels to tap into knowledge and enter new markets through well-known instruments such as making technical visits, inviting technical experts, and participating in conventions, trade shows, and business fairs.

4.6.3. *Clusters with policy for inception.*

Policy support has been key to the inception of Guyana's non-traditional agricultural products, aquaculture, forestry, and tourism clusters. Compete Caribbean has supported promoting a complex program of trust building among the local actors coordinated by a facilitator in the non-traditional agricultural products and in tourism clusters. Important components of the programs are training and capacity building for local economic enterprises. In non-traditional agriculture, aquaculture, and forestry, cluster support also plays a key role in spreading environmental best practices, facilitating adoption of international standards, and facilitating access to external sources of knowledge by organizing technological trips and visits abroad and by bringing technical experts into the clusters. A further element of inception policies concerns access to markets by developing marketing plans, designing and promoting common brands, and collectively participating in commercial tours and international trade fairs.

5. A Typology of Clusters

5.1. *Cluster Analysis*

We identified groups of clusters using cluster analysis, a multivariate statistical technique to identify different groups of similar actors, along certain selected characteristics (geographical boundaries, cluster structure, collective efficiency, innovation capacity, openness, and stage of the life cycle; see Table 5.1).⁶ We identified three groups of clusters: two (Groups 1 and 3, *rising* and *innovative*) are fairly similar and markedly different from the other group (Group 2, *sluggish*). (For a list of the clusters belonging to the different groups, see Table A1 in Appendix 2). Table 5.2 and Figure 5.1 summarize the main characteristics of the three groups.

⁶ We used SPSS software for the analysis.

Table 5.1: Codification of the Variables

Variables	Codification
Geographical Boundaries	<i>Categorical</i> <ul style="list-style-type: none"> • Local • Urban • National • Inter-Caribbean • Local/Inter-Caribbean
Organizational Structure	<i>Categorical</i> <ul style="list-style-type: none"> • Marshallian • Hub and spoke • Survival
Collective Efficiency <ul style="list-style-type: none"> • External Economies • Joint Action 	<i>Nominal</i> <ol style="list-style-type: none"> 1. Low 2. Low/Medium 3. Medium 4. Medium/High 5. High
Innovation Capacity	<i>Nominal</i> <ol style="list-style-type: none"> 1. Low 2. Low/Medium 3. Medium 4. Medium/High 5. High
Openness	<i>Nominal</i> <ol style="list-style-type: none"> 1. Closed 2. Closed-Opening 3. Semi-Open 4. Open
Stage of Life Cycle	<i>Categorical</i> <ul style="list-style-type: none"> • Emerging • Growing • Sustaining • Declining

Table 5.2: A Typology of Caribbean Clusters

Type of Cluster (#)	Cluster	Geographical Boundaries (#)	Organizational Structure (#)	Collective Efficiency (Average)		Innovation Capacity (Average)	Openness (Average)	Stage of Life Cycle (#)	Policy (#)
				EE	JA				
Rising (13)	Guyana (non-traditional agriculture) Grenada (nutmeg) Guyana (coconut water) Jamaica (ornamental fish) Inter-Caribbean (rum) Guyana (fishing) Guyana (birding) Jamaica (Treasure Beach) Grenada (geo-tourism) Suriname (Upper Suriname River Area) Inter-Caribbean (animation) Barbados (multimedia) Inter-Caribbean (maritime services)	L (3) U (1) N (5) I-C (3) L/I-C (1)	Marshallian (8) Hub & Spoke (5) Survival (0)	2.38	3.77	2.46	3.46	Emerging (6) Growing (6) Sustaining (1) Declining (0)	Spontaneous (2) Inception (3) Development (5) Inception and Development (0) Spontaneous and Development (3)
Sluggish (8)	T&T (agro products in Felicity) T&T (agro products in Jerningham) Guyana (forestry and wood products) Guyana (gold jewelry) T&T (tourism in Carapichaima) T&T (tourism) T&T (pottery) T&T (retail)	L (4) U (1) N (3) I-C (0) L/I-C (0)	Marshallian (7) Hub & Spoke (0) Survival (1)	2.50	2.50	1.75	1.38	Emerging (1) Growing (3) Sustaining (3) Declining (1)	Spontaneous (3) Inception (1) Development (3) Inception and Development (1) Spontaneous and Development (0)
Innovative (11)	T&T (food sustainability) Guyana (aquaculture) Belize (shrimp) T&T (oil and gas production and services) T&T (Point Lisas Industrial Estate) T&T (music, film, Carnival) T&T (maritime services) T&T (financial services) T&T (business services) Jamaica (ICT/business services) Jamaica (printing and packaging)	L (1) U (2) N (8) I-C (0) L/I-C (0)	Marshallian (11) Hub & Spoke (0) Survival (0)	4.45	3.91	4.27	3.09	Emerging (0) Growing (9) Sustaining (2) Declining (0)	Spontaneous (1) Inception (0) Development (5) Inception and Development (2) Spontaneous and Development (3)

Notes:

Collective efficiency: EE = external economies; JA = joint action.

Geographical boundaries: L = Local; U = Urban; N = National; IC = Inter-Caribbean; L/I-C = Local/Inter-Caribbean.

5.1.1. *The rising clusters (Group 1).*

Rising clusters include mainly emerging and growing clusters at the early stages of the cluster life cycle. Clusters in this group specialize in industries relatively new to the Caribbean, such as animation and multimedia, or exploit new market segments, such as eco-tourism in Grenada, Guyana, and Suriname. Moreover, they tend to be very open to external actors, partially because they are populated by hub firms. In fact, this group includes all the hub-and-spoke clusters identified in this study. This organizational structure facilitates external connections because it allows cluster firms to access knowledge and markets. Two examples from Guyana are the coconut water cluster, which is organized around a processing firm from Trinidad and Tobago, and the non-traditional agricultural products cluster, which is led by an Israeli MNC.

In spite of being open and growing, these clusters do not display outstanding records of collective efficiency or innovation capacity, which we classified as medium on our scale. Hence these clusters still deserve policy attention to sustain cluster development.

This group includes 13 clusters in several countries: four in Guyana, two in Grenada, two in Jamaica, one in Suriname, one in Barbados, and three that are inter-Caribbean (see Table 5.2). *Rising* clusters specialize in tourism (5), natural resource based industries (4), creative industries (2), rum production (1), and maritime services (1). The geographical boundaries of this group is quite varied and it is worth noticing that all the inter-Caribbean clusters belong to this dynamic group. The organizational structure is also mixed with eight Marshallian clusters and all of the hub-and-spoke clusters (5) included in this study.

On average, the degree of collective efficiency is medium, with low/medium external economies and medium/high joint action. On average, the group's innovation capacity is low/medium but its openness is the highest of the three groups.

Six of the *rising* clusters are in the emerging phase of the life cycle. Of the remaining seven clusters, six are in the growing stage and only one is in the sustaining phase.

There are five spontaneous clusters, three subsequently treated by cluster policy for development. Of the remaining eight clusters, three were set up from scratch through policy interventions and five are supported by development policies.

5.1.2. *Sluggish clusters (Group 2).*

Sluggish clusters differ significantly from the other two groups. They are far less active and dynamic. On average, their collective efficiency is low/medium, their innovation capacity is very weak, and they have a low degree of openness. These clusters have a Marshallian organizational structure, meaning they are populated mainly by small local enterprises that interact at a subnational, urban, or national level. In some cases, firms target only the local market, which is a clear constraint for further growth (e.g., the pottery and retail clusters in Trinidad and Tobago, and the gold jewellery cluster in Guyana). This group includes several spontaneous clusters that have received no policy treatment, though many would benefit from cluster policies, as elaborated in the next section.

This group includes eight clusters in Trinidad and Tobago (6) and Guyana (2) in different sectors: agriculture and forestry (3), tourism (2), gold jewelry (1), pottery (1), and retail services (1). In terms of geography, these clusters are subnational (3), urban (1), and national (4). The organizational structure is primarily Marshallian, with one survival cluster.

On average, the degree of collective efficiency is low/medium for both external economies and joint action. Innovation capacity is low and the degree of openness very low. The clusters in this group are at different stages of the cluster life cycle: one is emerging, three are growing, three are sustaining, and one is declining.

Three clusters developed spontaneously with no policy interventions. For the other clusters, policy played a role in inception for one, in development for three, and in both inception and development for one.

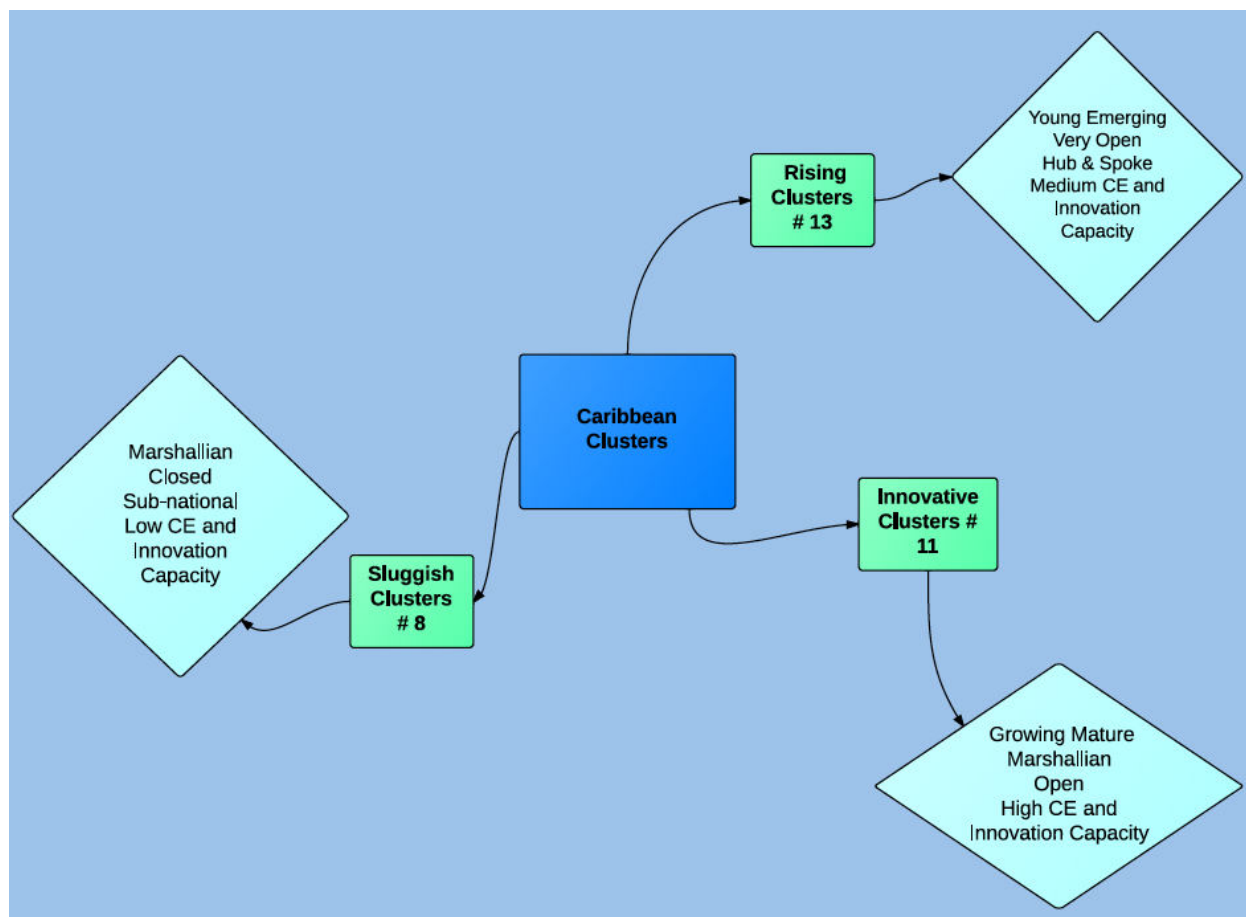
5.1.3. *Innovative clusters (Group 3).*

Innovative clusters share some similarities with *rising* clusters (i.e., high collective efficiency and openness), but *innovative* clusters are more innovative. This group is composed of Marshallian clusters displaying high collective efficiency and innovation capacity. Their sectors of specialization include some of the traditional Caribbean industries, such as oil production and business, financial, and maritime services, as well as the very dynamic aquaculture clusters in Guyana and Belize. This group appears to include the region's most successful clusters, and cluster policies have been implemented for most of them.

Table 5.2 shows that there are 11 *innovative* clusters located in Trinidad and Tobago (7), Jamaica (2), Guyana (1), and Belize (1). The clusters are mainly national (8), with only one local and two urban clusters. All clusters have a Marshallian structure. The group has a high degree of collective efficiency, with an average of external economies significantly higher than the other two groups and joint action also higher. Innovation capacity is higher than the other groups, while the degree of openness is significantly higher than *sluggish* clusters but not different from *rising* clusters. This group includes both growing (9) and sustaining (2) clusters. For the vast majority of these clusters, policies have been important both for inception and development.

To conclude, *rising* and *innovative* clusters include the most dynamic, active, open, and collaborative types of clusters in the Caribbean region, with some differences in terms of innovation capacity, cluster life cycle, and organizational structure. In contrast, *sluggish* clusters are the most passive and backward in the region.

Figure 5.1: Cluster Typology



5.2. Characteristics of Rising, Innovative, and Sluggish Clusters and Appropriate Policies

Clusters represent an opportunity to overcome some of the structural weaknesses suffered by Caribbean economies, namely the narrow scope for building economies of scale due to the small size of domestic markets, poor regional linkages, difficulty accessing external knowledge, and the low international competitiveness of their industries. Our cluster analysis suggests that specific cluster policies are likely to help these Caribbean countries overcome barriers to growth. To be effective, policies need to recognize that a certain degree of heterogeneity exists between clusters, and policies should therefore be tailored to the needs of the different clusters. To provide some context for policy considerations, we identified groups of clusters. Two groups of clusters are dynamic (*rising* and *innovative*), while one is very passive and backward (*sluggish*).

The *rising* and *innovative* clusters share some common key features. First, they are open to foreign markets and maintain external channels through which they can tap into knowledge and technologies. Second, cluster firms can take advantage of strong collective efficiencies achieved thanks to features such as the local availability of a specialized labor market or the presence of collective projects to share transportation costs, adopt international standards, introduce environmental best practices, or jointly sell products in international markets. In spite

of these similarities, *innovative* cluster firms display much higher innovative capacity than *rising* cluster firms, which tend to be younger and therefore have accumulated fewer technological capabilities.

Compared to the previous two cluster types, *sluggish* clusters have relatively closed systems, often lacking connections to external channels and access to international markets. Many show a low degree of collective efficiency and poor innovative capacity.

We believe that policy design should consider these differences and therefore propose recommendations specific to the three cluster groups identified here.

For *rising* clusters, policies should focus on fostering innovation, helping the transition of emerging clusters to the growing phase, and supporting the consolidation of leading actors.

- **Fostering innovation.** Innovation activities could be stimulated at the firm level through, for example, competitive bidding schemes to fund the most promising innovative projects, technological visits abroad, technical consultancies, or other technology-intensive activities. Innovation could also be stimulated through collective action, that is, by promoting collaborative projects such as joint design or other innovative activities, including acquiring foreign technologies and/or knowledge. Depending on the nature of the cluster, individual grants (or funding) may or may not be more suitable than funding collective projects. Certainly, clusters in this group have very high joint action records, which means that collective projects may be successful based on an already favorable social fabric.
- **Helping the transition of emerging clusters to the growing phase.** New clusters may face a number of challenges connected to the survival of startups, their consolidation in the market, and achievement of economies of scale. Supporting a transition phase could be achieved, for instance, by creating incubators that provide adequate training of specialized human capital, easing access to credit for innovative companies, or facilitating the access of young firms to public procurement.
- **Supporting the consolidation of leading companies.** Firms in *rising* clusters may need support to consolidate their leadership and to solve specific skill gaps in their transition from growth to maturity. Since leading actors are very important for the competitiveness of Caribbean clusters—to access external knowledge (i.e., they are often technological gatekeepers) and foreign markets—specific policies designed to support such leading actors may generate indirect effects on the whole cluster. Hence, we encourage policies to address the problems, constraints, and failures of these actors.

Innovative clusters are the most successful in the region. Policies should very selectively promote promising projects. Because *innovative* clusters are already dynamic, they should be sustained by targeting projects that are likely to further push them to the frontier of knowledge or to allow them to serve highly demanding or niche markets. Hence, these clusters should not be generally sustained (not least because they are already successful), but their best ideas or initiatives should be promoted by funding bodies to further promote skills and achieve very

ambitious targets. In these clusters, competition for funding should be very tough, with only a few exceptional projects being generously funded.

Finally, priorities for *sluggish* clusters should be strengthening local joint action, enhancing openness to access valuable resources like knowledge and technologies, and building innovative capacity.

1. **Strengthening local joint action.** Joint action can be strengthened by setting up activities and initiatives that might be of interest to different actors, such as workshops discussing the future challenges of the cluster, strategies to improve the cluster's situation, market opportunities, and achievable goals. These initiatives might also involve trust-building activities.
2. **Building innovative capacity.** This is certainly the most difficult task since accumulating capabilities takes a long time and involves investments with uncertain returns. However, activities to improve the skills of the local workforce, improve design capabilities and creativity in given industries, or develop/improve products and processes are important for these firms.
3. **Enhancing openness.** Increased openness could facilitate access to valuable resources like innovation and technologies. Activities could include participation at fairs, technological visits, and visits from foreign actors, such as consultants, who can introduce new knowledge. *Sluggish* clusters would also benefit from involvement in GVCs, with a foreign or national large buyer or, in some cases, even insertion into fair trade or ethical value chains being interesting options. To achieve this, it is important to develop programs that help local firms meet the quality standards and certification requirements needed to be part of GVCs and to help them identify new market opportunities and new market segments.

It is possible that such policies would achieve very little because firms in *sluggish* clusters may not be receptive of any kind of support. However, it is also true that these policies could contribute positively to the survival of micro-small entrepreneurs, which in certain contexts has a positive social impact in the cluster and in the nearby area (e.g., more jobs or training opportunities).

As is true for policy in general, systematic monitoring and evaluation of whether measures deliver the expected results in terms of enhanced local inter-firm coordination, networking with extra-cluster actors, and economic, social, and environmental performance is a must and should become part of standard practice to foster necessary and continuous experimentation and policy learning.

To this end, during the policy preparation stage, an evaluation plan should outline indicators to monitor and evaluate progress over the different implementation phases and an evaluation specialist should always be part of the team responsible for policy measures (Giuliani, Maffioli, Pacheco, et al., 2014). Moreover, in launching a policy, clear benchmarks and criteria for success and failure should be given to applicants and beneficiaries. Ideally cluster policy evaluation involves different qualitative (i.e., case study) and quantitative methods, such as

social network analysis and non-experimental techniques involving propensity score matching, difference-in-differences, instrumental variables and regression discontinuity design. Evaluation should be suited to testing the causal relationship between the policy measure and the performance of beneficiary firms.

To conclude, cluster policies are an interesting laboratory for local level spread of new forms of private–private, public–private, and public–public collaborations that could not have happened spontaneously (Pietrobelli et al., 2013). The emerging collaborative governance structures have the potential to become a platform on which more sophisticated collective actions can occur. Participatory strategic planning at the cluster level is a very useful tool to identify missing public inputs and create consensus around interventions associated with clusters.

6. Concluding Remarks on the Future Prospects of Clusters in the Caribbean

Our analysis of 32 clusters across several countries and industries in the Caribbean allowed some important and empirically robust observations:

- Cluster activity is very intense in the region.
- Caribbean clusters are very diverse on several key dimensions. We were able to identify three groups: *rising*, *innovative*, and *sluggish* clusters.
- Supporting policies should be differentiated to address and reinforce different strengths and weaknesses in clusters.
- A variety of supporting interventions have already been implemented in the Caribbean, some of which are good examples.

Based on this solid empirical evidence, some informed speculations can be drawn about the future prospects for growth in clusters and about if and how they can be expected to impact economic development in the Caribbean.

This study shows that new promising industries are flourishing thanks to a combination of private entrepreneurial spirit and good public policies. Clusters in creative industries, in business services, in non-traditional agro products, and in aquaculture, and some clusters in tourism addressing new segments of the market are dynamic and have good potential for future growth. These dynamic clusters should play a key role in signaling to the rest of the economy that diversification, entrepreneurship, and innovation are possible in the Caribbean region when the private and the public sector work together.

Importantly, new skilled jobs could be developed in these dynamic clusters, helping address brain drain, one of the most challenging problems in the Caribbean.

Further, some of these clusters show that external connections, through MNCs or within GVCs, are key to exports and to accessing knowledge and acquiring capabilities needed to be competitive in international markets.

Among the biggest constraints to growth in the Caribbean are the small size of the countries and the associated lack of economies of scale. In clusters, external economies and joint actions

represent opportunities to address these limitations. This study provides interesting examples, including the coordination of lodges in Guyana and the promotion of successfully adopted environmental standards in shrimp production in Belize.

Addressing these constraints at the cluster level is important and, as demonstrated, can be successful. Nevertheless, there is still a lot of potential to promote external economies and cooperation between clusters, industries, and countries. Therefore, there is an urgent need for an integrated and coordinated approach to clusters to strengthen the complementarities between industries such as the creative sectors, tourism, agro-products, and aquaculture. Countries in the region need to collaborate to build a regional innovation system so that institutions, such as the metrology institute or the standardization bodies, can assist companies at a regional level. Knowledge flow between companies and research bodies at the regional level should be incentivized, for instance by funding competitive tenders for research programs involving companies and research institutions from different countries in the region.

Existing dynamic clusters represent very good examples of what can be achieved at the collective level, thanks to external economies and joint actions. Now the challenge is to extend the approach on an intra-Caribbean scale, with an eye open for key external connections.

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Appendices

Appendix 1: Cluster Reference Documents

Natural Resource Based	
Agriculture	
Guyana (non-traditional agriculture)	<ul style="list-style-type: none">• OTF Group. (2010), Cluster Best Practices for the Caribbean Private Sector Development, Discussion Paper 5, September, Washington, DC: Inter-American Development Bank.• CARANA Corporation. (2009), Guyana Trade and Investment Support Final Report, April, Washington, DC: USAID.• Inter-American Institute for Cooperation on Agriculture. (2011), IICA Technical Cooperation Strategy in Guyana 2011-2014, San Jose, Costa Rica: IICA.• Ministry of Agriculture. (2014), Guyana Marketing Corporation, Georgetown, Guyana: Ministry of Agriculture [online] www.newgmc.com (accessed: July 26, 2014).
Grenada (nutmeg)	<ul style="list-style-type: none">• Ffowcs-Williams, I. (2013), Cluster Competitiveness Improvement Plan Upgrading Grenada's Nutmeg Cluster, July, Christ Church, Barbados: Compete Caribbean.• Government of Canada. (2013), Nutmeg is crucial to Grenada's economy and Canada is helping to improve it, Ottawa, Canada: Government of Canada [online] http://www.canadainternational.gc.ca/barbados-barbade/eyes_abroad-coupdoeil/nutmeg-muscade.aspx?lang=eng (accessed: July 26, 2014).
Trinidad & Tobago (agro products in Felicity)	<ul style="list-style-type: none">• Ramsawak, R., Carrillo, M., Lezama, S., Ali, J., Ali, S. and Pacheco, M. (2013), Competitive Analysis of the 4C Growth Pole: Opportunities for Cluster and Business Development, January, St Augustine, Trinidad and Tobago: Arthur Lok Jack Graduate School of Business, the University of the West Indies.
Trinidad & Tobago (agro products in Jerningham)	<ul style="list-style-type: none">• Ramsawak, R., Carrillo, M., Lezama, S., Ali, J., Ali, S. and Pacheco, M. (2013), Competitive Analysis of the 4C Growth Pole: Opportunities for Cluster and Business Development, January, St Augustine, Trinidad and Tobago: Arthur Lok Jack Graduate School of Business, the University of the West Indies.
Agro-processing	
Guyana (coconut water)	<ul style="list-style-type: none">• Compete Caribbean. (2013), Compete Caribbean Plan of Operations: Establishment of the Pomeroon Producers Association, Project Number RG-CC3059, October, Christ Church, Barbados: Compete Caribbean.• Webber, B. (2013), Cluster Competitiveness Improvement Plan for The Lower Pomeroon Coconut Cluster, October, Christ Church, Barbados: Compete Caribbean.
Trinidad & Tobago (food sustainability)	<ul style="list-style-type: none">• Ministry of Planning and Sustainable Development. (2012), Building Competitive Advantage: Six Strategic Business Clusters and Enablers, July, Port-of-Spain, Trinidad and Tobago: Ministry of Planning and Sustainable Development.

Forestry

Guyana
(forestry and wood products)

- OTF Group. (2010), Cluster Best Practices for the Caribbean Private Sector Development, Discussion Paper 5, September, Washington, DC: Inter-American Development Bank.
- CARANA Corporation. (2009), Guyana Trade and Investment Support Final Report, April, Washington, DC: USAID.
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Aquaculture

Guyana
(aquaculture)

- OTF Group. (2010), Cluster Best Practices for the Caribbean Private Sector Development, Discussion Paper 5, September, Washington, DC: Inter-American Development Bank.
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Belize
(shrimp)

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Jamaica
(ornamental fish)

- Compete Caribbean. (2013), Plan of Operations Cluster, Collaborate, Export and Thrive: The Growth of an Ornamental Fish Industry in Urban Communities in Jamaica, Project Number JA-CC3053, October, Ottawa, Canada: Government of Canada.
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Energy

Trinidad & Tobago
(oil and gas products and services)

- Ministry of Planning and Sustainable Development. (2012), Building Competitive Advantage-Six Strategic Business Clusters and Enablers, July, Port-of-Spain, Trinidad and Tobago: Ministry of Planning and Sustainable Development.
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Trinidad & Tobago
(Point Lisas Industrial Estate)

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Manufacturing

Guyana
(gold jewelry)

- DaSilva-Glasgow, D. (2013), Global Value Chain Analysis of the Gold Jewellery Industry: Upgrading Trajectories for Guyana, , April, St Augustine, Trinidad and Tobago: Caribbean Centre for Competitiveness, Institute for Critical Thinking, University of the West Indies.
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Various countries
(rum)

- Braun-Munzinger, C. (2011), Accompanying Trade Liberalisation through Regional Industrial Policy: A Case Study of the EU Aid for Trade Programme to the Caribbean Rum Sector, Manchester, UK: University of Manchester.
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Guyana
(birding)

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(tourism in Carapichaima)

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Jamaica
(Treasure Beach)

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Grenada
(geo-tourism)

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Suriname
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Barbados
(multimedia)

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Trinidad & Tobago
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Other Services

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(maritime services)

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Trinidad & Tobago
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Trinidad & Tobago
(retail)

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Jamaica
(ICT/business services)

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Jamaica
(printing and packaging)

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Various countries
(maritime services)

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Appendix 2: The Cluster Analysis

Table A1: Cluster Membership

Cluster Name	Type of Cluster	
	Code	Name
Guyana (non-traditional agriculture)	1	Rising
Grenada (nutmeg)	1	Rising
T&T (agro products in Felicity)	2	Sluggish
T&T (agro products in Jerningham)	2	Sluggish
Guyana (coconut water)	1	Rising
T&T (food sustainability)	3	Innovative
Guyana (forestry and wood products)	2	Sluggish
Guyana (aquaculture)	3	Innovative
Belize (shrimp)	3	Innovative
Jamaica (ornamental fish)	1	Rising
T&T (oil and gas products and services)	3	Innovative
T&T (Point Lisas Industrial Estate)	3	Innovative
Guyana (gold jewelry)	2	Sluggish
Various countries (rum)	1	Rising
Guyana (fishing in North Rupini)	1	Rising
Guyana (birding)	1	Rising
T&T (tourism in Carapichaima)	2	Sluggish
T&T (tourism)	2	Sluggish
Jamaica (Treasure Beach)	1	Rising
Grenada (geo-tourism)	1	Rising
Suriname (Upper Suriname River Area)	1	Rising
Various countries (animation)	1	Rising
Barbados (multimedia)	1	Rising
T&T (music, film, Carnival)	3	Innovative
T&T (pottery)	2	Sluggish
T&T (Maritime services)	3	Innovative
T&T (Financial services)	3	Innovative
T&T (Business services)	3	Innovative
T&T (Retail)	2	Sluggish
Jamaica (ICT/business services)	3	Innovative
Jamaica (Printing and Packaging)	3	Innovative
Various countries (Maritime services)	1	Rising

Table A2: ANOVA and Bonferroni Tests on Group Differences

		Number of Clusters	Mean	Standard Deviation	Standard Error	ANOVA Sig.
External Economies	1	13	2.38	0.768	0.213	0
	2	8	2.50	0.756	0.267	
	3	11	4.45	0.934	0.288	
	Total	32	3.13	1.264	0.223	
Joint Action	1	13	3.77	0.832	0.231	0.008
	2	8	2.50	1.195	0.423	
	3	11	3.91	0.944	0.285	
	Total	32	3.50	1.107	0.196	
Innovation Capacity	1	13	2.46	0.877	0.243	0
	2	8	1.75	0.707	0.250	
	3	11	4.27	0.786	0.237	
	Total	32	2.91	1.304	0.231	
Openness	1	13	3.46	0.660	0.183	0
	2	8	1.38	0.744	0.263	
	3	11	3.09	0.944	0.285	
	Total	32	2.81	1.148	0.203	

Test Post Hoc

Variable	# of Cases in Cluster (I)	Cluster # (J)	Mean Differences (I-J)	Standard Error	Sig.
External Economies	1	2	-0.115	0.371	1
		3	-2.07	0.339	0
	2	1	0.115	0.371	1
		3	-1.955	0.384	0
	3	1	2.07	0.339	0
		2	1.955	0.384	0
Joint Action	1	2	1.269	0.435	0.02
		3	-0.14	0.397	1
	2	1	-1.269	0.435	0.02
		3	-1.409	0.45	0.012
	3	1	0.14	0.397	1
		2	1.409	0.45	0.012
Innovation Capacity	1	2	0.712	0.363	0.179
		3	-1.811	0.331	0
	2	1	-0.712	0.363	0.179
		3	-2.523	0.375	0
	3	1	1.811	0.331	0
		2	2.523	0.375	0
Openness	1	2	2.087	0.354	0
		3	0.371	0.323	0.781
	2	1	-2.087	0.354	0
		3	-1.716	0.366	0
	3	1	-0.371	0.323	0.781
		2	1.716	0.366	0

Table A3: Statistics on Nominal Variables and Phi-Tests on Group Differences

		Number of Cases per Cluster Group			Total
		1	2	3	
Geographical Boundaries	Subnational	3	4	1	8
	Urban	1	1	2	4
	National	5	3	8	16
	Inter-Caribbean (I-C)	3	0	0	3
	Subnational and I-C	1	0	0	1
Phi Test (sig.)		0.189			
Organizational Structure	Marshallian	8	7	11	26
	Hub and Spoke	5	0	0	5
	Survival	0	1	0	1
Phi Test (sig.)		0.022			
Cluster Life Cycle	Emerging	6	1	0	7
	Growing	6	3	9	18
	Sustaining	1	3	2	6
	Declining	0	1	0	1
Phi Test (sig.)		0.035			
Cluster Policies	Spontaneous	2	3	1	6
	Inception	3	1	0	4
	Development	5	3	5	13
	Inception and Development	0	1	2	3
	Spontaneous plus Development	3	0	3	6
Phi Test (sig.)		0.340			