A Diamond for the Poor?
Assessing Porter's Diamond Model for the Analysis of Agro-Food Clusters in the Developing Countries.

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Abstract: Clusters are a critical way for agri-food SMEs to be(come) competitive in this era of globalization. Several theoretical models (e.g., flexible specialization, collective efficiency) have been developed to study clusters. One prominent model, Porter's diamond model, has been ignored in cluster research in developing countries. This paper argues that this is not justified and that Porter's more holistic diamond model is superior in explaining cluster dynamics.

1. Introduction

The competitive environment for the mostly small scale agri-food businesses in the developing countries has been dramatically altered in recent years. Their new environment is characterized by globalization, liberalization and extensive organizational, institutional and technological change (Reardon and Barrett 2000). The success of firms in developing countries is now no longer measured against a national, but rather an international benchmark. In the face of this daunting challenge, one industrial strategy that appears to warrant optimism for small and medium sized enterprises (SMEs) is clustering. This optimism is based on the discovery of Italian SME clusters and research that showed that SME clusters can be competitive in the new global economy (see for example Goodman and Bamford 1989). The potential of industry clusters in developing countries has over the last decade breathed new life into small scale industry research (Schmitz and Nadvi 1999).

Although the externalities of clusters were already brought forward by Marshall (1920), the relative newness of the ideas implies that different paradigms are currently fighting for attention. Furthermore, because of their different backgrounds, scholars of clusters in developing countries have used analysis frameworks that differ from those proposed for advanced countries. One prominent paradigm applied in advanced countries, but almost absent in research on developing countries, is Porter's diamond model[1]. By assessing the applicability of this model for the analysis of agro-industrial clusters in the developing countries, this paper aims to bring the two strands of literature closer together.

This paper consists of five sections. Section two presents Porter's diamond model as well as two paradigms used to study clusters in developing countries (i.e., flexible specialization and collective efficiency). Section three investigates to what extent clusters in developing countries versus developed countries are different: we argue they are sufficiently similar so as not to warrant the use of different paradigms. Section four investigates the potential contributions of the diamond model by comparing it with the other models used to study agro-industrial clusters in developing countries. We conclude by giving some recommendations for further research.

2. The diamond model and other models used to study clusters

A cluster can be defined as a group of firms engaged in a particular product market in a particular location. Over the last decade, different models have been developed to study clusters. Porter's *diamond model* is the result of a four year study based on observations from a multitude of sectors in ten countries (developed and NIC). However, researchers studying clusters in developing countries have tended to ignore Porter and to use different theoretical frameworks, two of which have been used widely in empirical work: *flexible specialization* and *collective efficiency*. These two models, as well as Porter's diamond model, are reviewed in the sections that follow.

Porter's Diamond Model

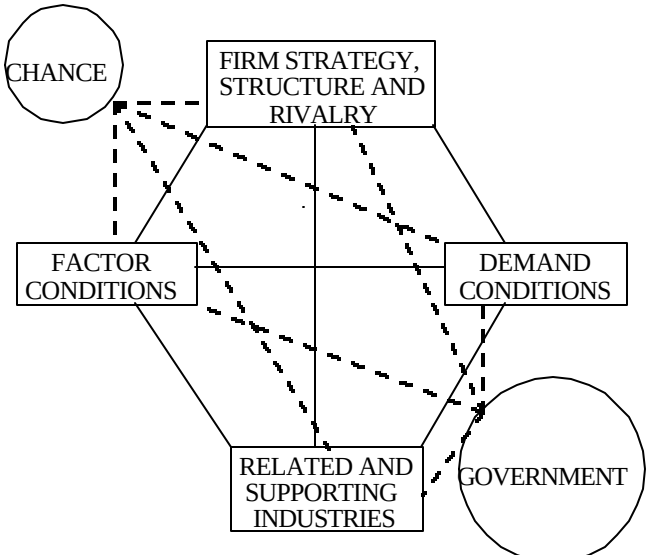
Porter (1998) observes that the 18th century work of Adam Smith and David Ricardo on factor comparative advantage cannot provide explanations for most of the trade that takes place today. More

[1]In the introduction of the 1998 edition of The Competitive Advantage of Nations, Porter states that "the application of the principles of [the book] to developing countries has spread widely" (p. xiv) and lists a number of studies. A review of the literature on clusters in international development, however, reveals absence rather than spread of these principles in this particular field.

recent explanations involving macro-economic variables, cheap and abundant labor or natural resources, government policy, product life cycles or management practices are equally unsatisfactory. Porter shifts the focus to specific industries in his quest for a better paradigm. At this micro-level, competitiveness is the result of either low costs or differentiation, which in turn depends on a number of factors such as: economies of scale, technology development, size of the home base and so on. The question now becomes: why do these determinants arise in certain specific environment? This is not a random process; rather the increased importance of the role of location is revealed.

The diamond model (Figure 1) proposes four interrelated facets, each of which representing a determinant of regional advantage: (1) firm strategy, structure and rivalry; (2) demand conditions; (3) factor conditions; and (4) related and supporting industries. "Chance" and the "government" are two factors that influence these four determinants, but are not determinants themselves. Together these six factors form a system that differs from location to location, thus explaining why some firms (or industries) succeed in a particular location. Not all six factors need to be optimal for firms or industries to be successful.

Figure 1: Porter's Diamond Model



Source: Porter (1998, p. 127).

The bi-directional influences between all factors create the dynamics of the system and also point to ten relationships that could be investigated. The dynamics of the system are not spread evenly over an economy but concentrate in clusters in industries which have reached the highest level of competitiveness and productivity. Clusters are defined by Porter as groups of industries related by links of various kinds. Like organisms, clusters are born, evolve and ultimately disappear.

The diamond theory explains clearly how each determinant is influenced by the other three determinants. For example, intense rivalry, the existence of world class research institutes and suppliers, and sophisticated home demand all contribute to creating those advanced and specialized factors that

contribute the most to increased productivity. Reliance on only one factor (e.g., cheap labor) is over time unsustainable (other nations will provide even cheaper labor). Adeboye (1996) calls dependence on cheap factors the low road to competitiveness, which according to Porter is the most traveled road: the abundance of a factor leads to its inefficient deployment. Examples where the inter-firm interactions have resulted in super competitive clusters are the food additives industry in Denmark and the U.S. agricultural machinery industry.

We now turn to the two frameworks that have been widely applied in the study of clusters in developing countries: flexible specialization and collective efficiency.

The Flexible Specialization Framework

The flexible specialization framework was put forward by Piore and Sabel (1984) in their study describing the successful Italian SME experience. In the first half of the nineties, it was the most used framework for studying clusters in developing countries. The core idea of the framework was that flexible companies outperformed mass manufacturers, especially in times of crisis. In the mass manufacturing paradigm ("Fordist"), low cost production was the key and this required large markets, large production volumes, specific machinery, narrowly trained workers and top down authority. The flexible specialization paradigm on the other hand is characterized by: product characteristics (instead of price), market segmentation, economies of scope through adaptive machinery, broader participation by multi-skilled employees in the production process (such as in the TQM approach), product innovations, quickly following the consumers (requiring JIT, QR, ECR). The relationships with other firms become organic and promote innovation.

The Collective Efficiency Model

Expanding on Marshall's insights on the externality advantages of clustering, Schmitz (1995) introduced the concept of collective efficiency (CE). CE has a passive and an active component: incidental effects (positive and/or negative externalities) and intended effects (resulting from joint action). First, positive externalities can arise from market access (the cluster attracts demand), labor market pooling (increasing labor skills), intermediate input effects (specialized suppliers will arise) and technological spillovers (technological diffusion). Second, according to Schmitz (1997), joint action has two dimensions: the number of participants (bilateral or multilateral) and the direction (vertical or horizontal). There are also opportunity costs to joint action: for example, will the investment in the joint action pay off? The raison d'être for clusters has to be analyzed by looking at both components, because only looking at externalities will not lead to an understanding of the growth of clusters. Growth requires a dynamic cooperation to build marketing channels or to improve production technology, for example. Recent additions to the framework include the institutional context (McCormick 1999). For example, Humphrey and Schmitz (1996) argue that government interventions must follow a triple C-approach: customer oriented (market knowledge for firms), collective (e.g., encouraging co-operation) and cumulative (making further upgrading self sustainable).

Summary

In summary, there appear to be at least three different frameworks for the study of clusters (see Table 1): flexible specialization and collective efficiency are used to study clusters in developing countries, while Porter's model is more widely used in the more advanced countries. Before we compare the different models with respect to their ability to help us understand agri-food clusters in economically less developed

countries (ELDCs), it must first be established whether clusters in ELDCs are so different from those in developed countries that they require separate frameworks.

Table 1. A Comparison Between Different Models Used to Study Clusters

	Diamond Model	**Collective Efficiency**	**Flexible Specialization**
Cluster Definition	A group of interconnected firms and institutions in a particular field present in a particular location (Porter 1998, p. xii)	A group of producers making similar things in close vicinity to each other (Schmitz 1995, p.533)	"Cluster" is an industrial district, i.e. a core of more-or-less equal small enterprises bound in a complex web of competition and cooperation (Piore and Sabel 1984, p. 265)
Key Constructs	Firm Strategy, Structure and Rivalry Factor Conditions Demand Conditions Related and Supporting Industries	Externalities Joint Action	Flexibility Economies of Scope Innovation Product Differentiation
Goal/Focus	Value Creation Holistic Dynamic	Cost Efficiency/Risk Narrow Static	Value Creation Narrow Dynamic
Key Studies	Porter (1998)	Schmitz (1995)	Piore and Sabel (1984)

3. Clusters in developing countries

The Italian SME studies (published in the late eighties, early nineties) were followed by a period of fact gathering and the re-examination of secondary data on clusters in developing countries. Then, a substantial body of case-study material emerged (Schmitz and Nadvi 1999). From this body of literature, several things became evident. First, it was learned that, although less common in ELDCs than in developed countries (Adeboye 1996), industrial clustering exists and is significant (Schmitz and Nadvi 1999). Second, clusters appear to outperform dispersed firms (Adeboye 1996, Visser 1999). Empirical research has convinced international organizations like UNCTAD that "clusters and networking are among the best options to support the growth of SMEs and their ability to compete effectively in the global economy" (UNCTAD 1998 executive summary).

Third, there are different types of clusters and different classification systems. For example, according to McCormick (1999), there are groundwork clusters (seed beds), industrializing clusters (beginning to specialize, differentiate and innovate) and complex industrial clusters. Altenburg and Meyer-Stamer (1999) identified the following three types of clusters in Latin-America: (1) survival clusters of micro- and small scale enterprises; (2) more advanced and differentiated mass producers (from the import substitution era); and (3) clusters of transnational corporations (often foreign firms). Noteworthy in Adeboye's (1996) classification of clusters is that he puts ELDC clusters in a separate group, not so much because of a difference in origin, but because they show less (or even absence) of the dynamic, interactive

and learning characteristics or the highly skilled and educated labor force of the "Rhine model" (i.e., European clusters founded on a strong technical culture of general, specific and tacit skills). These differences are not necessarily fundamental, but rather may reflect a lower evolutionary step. One important reason for these differences is that efficient markets have been and largely still are absent in ELDCs. Because markets have worked better, clusters in developed countries have been based more on value creation than on cost reduction.

Fourth, clusters cannot be created from scratch; there needs to be a critical mass of enterprises and skills (however rudimentary) that, for example, outside assistance can "hook into" (Schmitz and Nadvi, 1999 p. 1509). This is true in developed and developing countries.

Fifth, in developing countries, clusters play a critical role as seed beds of the industrialization process (Weijland 1999). Their specialization implies that a large task with large total investment can be broken down into small riskable steps with small investments, allowing entrepreneurship to surface and flourish (Schmitz 1997). This entrepreneurial spirit is clearly present in developing countries: the number of micro and small enterprises is far larger than what is reported in most official statistics and SMEs are being established at a substantial rate (Mead and Liedholm 1998). Clusters mobilize unused ("hidden") resources and make them perform efficiently (Schmitz and Nadvi 1999).

Finally, after they have reached a more mature stage, clusters take up the challenge of globalization and liberalization. This requires producing according to international benchmarks of product quality (consistency, packaging, standards & grades, branding) and production flexibility (consumer response). Clusters at this stage are more common in developed countries.

In conclusion, clusters in ELDCs are not exact copies of clusters in developed countries but they exhibit similar characteristics (Adeboye 1996) and similar evolutionary stages. Whatever difference exists, they do not appear to be fundamental and thus ELDC clusters and clusters in developed countries can be analyzed with a similar model that is broad enough to allow a structured approach. Thus, in the search for the best paradigm for studying clusters in developing countries, Porter's diamond model cannot be excluded.

4. The best paradigm for the study of agri-food industry clusters in developing countries

Research requires good working definitions: too narrow a definition puts blinders on the researcher and obscures critical factors, while too wide a definition makes the research unmanageable. McCormick (1999) for example rejects Porter's definition (see Table 1) because it does not accentuate the role of location enough. Therefore she resorts to the more narrow definition of Schmitz (1992): a geographic and sectoral agglomeration of enterprises. Porter's definition (Porter 1998, p. xii), appears wide enough to include critical factors in the growth process of clusters, but also narrow enough to be workable.

A limited number researchers use a definition of clusters that is closer in meaning to Porter's than to Schmitz's: they subsequently include important factors (e.g., a more distant but critical ferment supplier to a milk cluster), thus allowing a deeper understanding of clusters (Dirven 2000). Definitions tend to become wider when researchers studying clusters in very poor countries (e.g., most of Sub-Saharan Africa) are contrasted to researchers studying clusters in less poor countries (e.g., Latin America). The reason is that clusters become more mature and dynamic (more "Porterian") and physical infrastructure (transport & communication) improves, thus reducing the necessity of locating in close vicinity. Changing the domain

definition may make sense in terms of understanding "what is", it traps the researcher to the positivistic side of the coin; the normative side ("what should be") remains in the dark.

The diamond model is superior in explaining the dynamics of clusters and their role in increasing productivity through the process of industrialization. Increasing productivity is even more important to increasing welfare in developing countries than it is in developed countries. Cluster dynamics are recognized in the dynamic nature of the determinants themselves and in their interactions. Of these dynamics, Porter states that: "clusters not only reduce transaction costs and boost efficiency but improve incentives and create collective assets in the form of information, specialized institutions, and reputation among others... More important, clusters enable innovation and speed productivity growth" (Porter 1998, p. xii). The other models focus much more on efficiency and transaction costs and leave out the important linkage aspects. Schmitz for example admits that the collective efficiency framework shows deficiency in capturing the role of external linkages (Schmitz and Nadvi 1999). In dynamic clusters, these linkages are more than mere spot market transactions influenced by market power. They involve the movement of capital (e.g., FDI), people (e.g., entrepreneurs), information (e.g., on shifting consumer tastes) and knowledge (e.g., technology). For example, international supermarkets seek relationship based alliances with clusters of horticultural producers in ELDCs. Supermarkets take on the role of channel captains (organizing chains from "gate to plate") and brokers who play the role of gatekeepers and exploit information asymmetries are replaced. Critical in building these dynamic linkages is the presence of trust, which in turn requires integrity of the partners involved.

From analyzing the case studies using the collective efficiency model, it appears that many of the linkages in the Porter model are indeed discussed, but they are not formally part of the CE model. These discussions are to a large extent descriptive: the links are there, but not their process characteristic. According to McCormick, certain anomalies could only be explained by other contextual variables, outside the collective efficiency framework (McCormick 1999). These deficiencies of the CE framework were researched by following key suggestions (Schmitz and Nadvi 1999) such as more comparative work, more attention to external linkages, and more concern with knowledge flows.

It may appear that ELDCs have little to start with: no rivalry, no effective home demand, no supporting industries, no factors other than cheap labor. To a large extent, this is so. There are however also "hidden resources" that allow for a lot of leverage but that face significant frictions (in the physical and transaction cost sense). Making these hidden resources surface will require an effort that is like "plowing the sea" (Fairbanks and Lindsay 1997) or, in the words of David Landes, "[closing the gap between developed and developing countries] is impossible... But we must act as if it were not, for the reward is in the trying" (Landes 1990 p.12). The diamond model can be an excellent tool in the process of seeking both where frictions and levers possibly lay and where we need to start searching for them.

It is important to realize that the diamond model does not make assumptions on what is in place in a given cluster. This cannot be said about the flexible specialization paradigm. The immediate appeal of flexible specialization -- namely, the idea of small firms being competitive, especially in times of crisis -- is greatly offset by the unrealistic assumptions that need to be in place: multi-purpose machines, broad skills, varied products, innovation, etc. Although some case studies show these exist in ELDCs (Dijkman and Van Dijk 1997), for the most part in most ELDC clusters: (i) the labor surplus leads to low labor costs rather

than to productivity increases through innovation; (ii) technology is inferior; and (iii) worker participation and the required institutional framework (including trust) are non-existent (Das and Panayiotopoulos 1996)

5. Conclusions and recommendations for further research.

Models currently used to study clusters in developing countries are either not very applicable for the developing countries (flexible specialization) or miss critical elements like external linkages with (collective efficiency framework).Users of these models directly or indirectly start looking for answers outside the chosen framework, thus indicating the need for a more encompassing framework. Porter's diamond model thus appears to be intrinsically better. Its principles are based on research in a wide variety of countries and industries. The model has not been tested to a great extent in developing countries, but those rare studies that have used it have affirmed its validity and called for more extensive applications of the model in this setting. What is needed most now is more case studies that use the diamond model.

One possible reason why the diamond model is not used is that it is thought to assume circumstances that are too unlike those present in developing countries. However, agro-food clusters are not fundamentally different in developing countries; the differences are evolutionary. An important area for research in this context is the study of where clusters originate. This would add historical depth to our understanding and would allow better comparative analysis between clusters in different locations across the world (Krugman 1991).

The Porter model does not assume an initial starting point nor an ideal to be strived for; rather it proposes processes that make a cluster move from one stage to another for better or worse. This dynamic is absent from other models. On the other hand, the popular collective efficiency framework has proven its value in understanding the current (static) structure of clusters in ELDC's. It would therefore appear beneficial to conduct research on how the best elements of these two models (and perhaps others) could be integrated into one general theory of the cluster.

Kuhn (1996, p. 17) stated: "To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted". This paper shows that Porter's diamond theory seems better than other paradigms currently used in the study of clusters in developing countries and, it is hoped, will therefore contribute to its acceptance by the scholars of clusters in the developing world.

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