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A Cluster-Based Industrial Development Policy for Low-Income Countries

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Abstract

The need to construct an effective strategy for industrial development in low-income countries has been largely ignored by development economists because industrial policies have failed in many developing countries. This does not imply, however, that industrial development cannot be promoted. This paper attempts to synthesize the conventional wisdom in development economics with recent advancements in various fields of economics (such as theories of endogenous growth and agglomeration economies) to provide a useful framework to design a strategy for industrial development, which consists of investments in managerial human capital followed by the provision of credit and the construction of industrial zones.

Key words: Competitive market environments, comparative advantage, industrial cluster, managerial training, provision of credit, construction of industrial zones

JEL classification: L6, O2

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I. Introduction

The last four decades have witnessed a large number of successful cases of industrial development in Asia but possibly an equally large number of failures in other developing countries, particularly in Sub-Saharan Africa (SSA). While the governments of developing countries have been eager to realize industrial development for the last several decades, development economists have not made serious attempts to design strategies to develop industries.² Probably this is due partly to the failure of import substitution policy and partly to the commonly accepted neoclassical presumption that “industrial policy” does not work, and thus governments have to do little to promote industrial development beyond the provision of infrastructure such as roads, electricity, and communication systems.

Such a presumption, however, is incorrect to the extent that the government is able to address major market failures better than any private or non-market institutions or to support such institutions’ corrective functions without causing a serious government failure. A major market failure arises from high transaction costs between manufacturing firms (e.g., assemblers and parts-suppliers) and between manufacturers and traders, particularly in developing countries, which are attributed to asymmetric

² There are, however, exceptions; e.g., Cimoli, Dosi, and Stiglitz (2009), Lin and Monga (2010, 2011), and Page (2011).

information and imperfect contract enforcement (e.g., Akerlof 1970; Williamson 1985; Hart and Moore 1990). An obvious institution counteracting this problem is industrial clusters, in which the transacting parties are located near each other to reduce transaction costs (Becker and Murphy 1992).

Industrial clusters are not a panacea, however. Its favorable effects are lessened by market failures other than transaction costs. First of all, the inadequacy of managerial human resources of firms in developing countries has been increasingly recognized in the recent literature (e.g., Bruhn, Karlan, and Schoar 2010). The case studies of industrial development in Asia and Africa by Sonobe and Otsuka (2006, 2011) reveal that entrepreneurs' managerial human capital plays a critical role in industrial development, as it affects improvements in production and management efficiency. More recent waves of randomized experiments demonstrate that the majority of entrepreneurs in developing countries have inadequate knowledge about standard management practices (e.g., Bloom *et al.* 2010). As with ordinary human capital, investment in managerial human capital is likely to be socially sub-optimal due importantly to inaccessibility to finance. By analogy to Arrow's argument (1962), we expect that this problem is exacerbated by information spillovers, which thwart the incentive for a head start in learning more about management. We argue that the government can help non-market private institutions facilitate managerial human capital accumulation and even assist in the emergence of a market for management knowledge.

Secondly, there is much evidence, based on randomized controlled and natural experiments (e.g., De Mel *et al.* 2008; Banajee and Duflo 2005), that small and medium firms in low-income countries are faced with severe credit constraints. It does not necessarily follow, however, that a policy toward industrial development should begin

with correcting this market failure problem. We argue that the provision of low-interest loans to credit-constrained firms is more effective if it is implemented after the provision of technical and managerial training for them.

The purpose of this article is to formulate an effective industrial development policy for low-income countries based on both the traditional and recent literature in development economics and related fields. Our presumption is that industrial development is successful only when it conforms to the changing pattern of comparative advantage from labor-intensive to capital-intensive and further to knowledge-intensive industries (Akamatsu 1962; Vernon 1966; Lin 2009). We believe that the engine of such development is technological progress including both innovation accompanied by the process of constructive destruction and less drastic but practically important improvements in production and management (e.g., Schumpeter 1912; Solow 1956; Romer 1986; Grossman and Helpman 1991). We agree with Gerschenkron (1962) and Deming (1994), among many others, that the major source of technological progress is the application of the appropriate knowledge of technology and management imported from developed countries to productive activities.³

This paper is concerned with the development of industries in low-income economies. In these economies, the application of imported knowledge to production and management is new and accordingly difficult for most enterprises, and improvements in production and management that seem simple to developed country enterprises often contribute substantially to productivity gains. This paper, therefore,

³ By now, this view has been widely accepted by development economists and other experts. Indeed, Japanese development since the Meiji era provides a vivid example of rapid economic development based on technology imports (e.g., Ohkawa and Rosovsky 1973; Otsuka, Ranis, and Saxonhouse 1988; Hamada *et al.* 2011). In their textbook on development economics, Hayami and Godo (2005) argue that successful technology transfer from developed to less developed economies is the key to the successful development of the latter.

uses the term “improvement in production and management” (IPM) to describe the result of the application of such knowledge with the connotation of innovation. In Section II, we begin by discussing how to promote the initiation of new appropriate industries, which is followed by the discussion of how to sustain the industrial development with a view to stimulating IPM in their subsequent development stages in Sections III and IV. In Section V, we consider the possibility of government failures which may defy the proposed strategy. Section VI concludes the paper by recapitulating the proposed industrial development policy.

II. Promotion of New Industries

There is no question that successful industrial development must follow the changing pattern of comparative advantages. In order to ensure such a development path, competitive market environments must be created and maintained by the government so that the scarcity of resources and the social value of goods are signaled by market prices. This is not enough, however, to initiate the industrialization; the initiation of a new industry is an innovative activity and, as Schumpeter (1912) clearly points out, innovation is likely to be imitated by followers, which tends to depress the incentives to innovate. One possible solution is to rely on the leadership of the government in the selection and promotion of appropriate industries. Recently Lin (2010) and Lin and Monga (2010, 2011) have proposed that the government in low-income countries should identify and promote industries which have successfully developed and become mature in slightly more advanced countries with similar factor endowments. While we agree with these authors that it will be a sound development strategy to imitate slightly more advanced countries, we admit that there is the risk of

government failure associated with the choice of industries, as is argued by Pack and Saggi (2006), and the ways in which support is provided.⁴ In this paper, we propose an “entrepreneur-led and government-assisted” approach to the establishment of new industries based on our own observation that there are a significant number of potentially competent entrepreneurs in low-income countries. Our approach is consistent with the theoretical proposition of Rodriguez-Clare (2007) that the best policy entails the direct promotion of clustering in the sector in which the country has a comparative advantage.

A View from Case Studies

Our argument is based importantly on our 19 case studies of cluster-based industrial development in Asia and Africa, which are listed in Table 1. All these clusters have been voluntarily formed by private firms, including the four cases in China, without much assistance from the government. Thus, these studies in China are comparable to the other case studies. The studies of four industrial clusters in Japan and Taiwan, China are also comparable because they were developed before these countries became highly industrialized. Table 2 reports the major characteristics of these clusters in terms of the number of firms, average size of employment, the average schooling years of entrepreneurs, and whether their products were exported. Although the average employment size tends to be small in industrial clusters in SSA (cases 8-10, 15-17, and 19), the number of firms is large compared with clusters in Asia. As will be discussed in the next section in more detail, the majority of the private firms in developing countries are located in industrial clusters, which we define as the

⁴ A case in point is the failure of the import substitution industrial policy, which provided distorted profit incentives to enterprises (Bhagwati 1978; Krueger 1978; Balassa *et al.* 1982). Lin and Monga (2011) propose the simplified industrialization strategy to avoid such failures.

localization of firms producing similar and related products (e.g., final products and parts). At least in the early stage of development, firms in these clusters were small family firms which employed a small number of workers.

Consistent with the Heckscher-Ohlin theorem, the initial products of these clusters, as shown in the parentheses in the last column, tended to be labor-intensive items. This tendency is clearer in the first group (i.e., cases 1 to 10) than in the second group (cases 11 to 17) and the third group (cases 18 and 19). The clusters in the first group were initiated by pioneering entrepreneurs who produced imitations of imported goods through reverse engineering without any help from the government or foreign firms. The development of the second group of clusters was based on foreign technologies brought by foreign direct investments (FDIs), state-owned firms (SOEs), or foreign artisans who migrated from Southern Europe and ran home-based businesses.⁵ In the third group, the clusters came into existence thanks to the training programs provided by foreign firms and international organizations.

In cases 1 to 10, new industries emerged as a result of the shift of main products or activities, which would occur to take advantage the existing institutions, infrastructures, and technologies.⁶ In Kumasi, Ghana (case 10), for example, metalworking firms, such as lathe turners, welders, and casting foundries, are clustered where thousands of car repair garages are concentrated because of the garages' high demand for metal processing services and because of the abundant supply of scrap metal from cars that cannot be repaired. The metalworking firms not only provide

⁵ Although printed circuit boards (PCBs) are core devices for electronics items and IT equipment, the PCBs produced in the clusters listed in Table 1 in their early days were technologically simple and produced without using expensive machinery.

⁶ This is consistent with the observation of Hidalgo *et al.* (2007) that countries move through the product space by developing new goods close to those they currently produce.

repair services but also manufacture a variety of metal products, such as corn mill machines, wheelbarrows, and cash safes. Among tailors in Addis Ababa and Nairobi (cases 8 and 9), those who accumulated wealth and won the buyers' trust expanded their businesses from tailoring into the factory production of ready-made garments. In cases 1, 4, 5, 7, 13, and 15, a number of entrepreneurs started as traders and then diversified their businesses into manufacturing. Such former traders tend to be high-performers, which is likely to reflect the importance of the knowledge and skills of management and marketing in the operation of manufacturing firms in developing countries. Those who are engaged in trading, car repairing, tailoring, and other simple production activities can be potential entrepreneurs in the sense that they have undertaken new manufacturing activities.

Industrial clusters in SSA face fierce international competition and other external pressures. For example, garment producers have suffered from the flood of donated used clothing, both garment and shoe producers must compete with better-looking but inexpensive substitutes imported from Asia, and metalwork manufacturers have faced with the surging material input prices due importantly to the rising material demand in Asia. Many of them, however, have survived these challenges by modifying product designs and by finding new marketing channels. While the number of firms in SSA is unknown, it is likely that SSA has much more clusters and entrepreneurs than the governments and researchers recognize.⁷ They produce lower-quality products less efficiently and invest less in both physical and human resources than their counterparts in other regions. One might wonder whether this is mainly due to their limited ability

⁷ We have found that the number of entrepreneurs operating in our study sites in SSA has not been captured by statistical and tax authorities. We have also found a few clusters in SSA that were not known to researchers.

or, more importantly, due to bad governance, inadequate financing, and poor infrastructure.

Bangladesh vs. Ethiopia

To explore the answer to this question, it may be useful to compare the garment industries in Bangladesh (case 18 in Tables 1 and 2) and Ethiopia (case 8).⁸ Both are least developed countries and regarded as relatively corrupt.⁹ Both countries attempted to develop their export-oriented garment industries from scratch. However, they have had contrasting outcomes. In Bangladesh, export-oriented garment production dates from 1979, when a newly established firm, Desh, entered a technical cooperation agreement with the then leading garment exporter, Daewoo, in Korea (Rhee 1990; Easterly 2002). These firms teamed up because both were sure that the creation of a cadre of professionals would allow the latent comparative advantage of Bangladesh in garment production to materialize. The agreement sent 130 young employees of Desh, who were university graduates, to Korea for intensive training for eight months at Daewoo's factory in production skills, management skills, and international procurement and marketing. The garment industry in Bangladesh has since continued to grow rapidly for three decades with the continual learning of technology and management from abroad. It now has more than 4,000 manufacturing firms, employs more than four million workers directly, and ranks among the world's largest producers of garment items (Mottaleb and Sonobe 2011).

By contrast, the government of Ethiopia attached only secondary importance to learning from abroad when it began promoting export-oriented garment production in

⁸ See Sonobe and Otsuka (2011, chapters 8 and 9) for details.

⁹ In terms of corruption, probably Bangladesh was worse, as being ranked the most corrupt country in the world from 2001 to 2005, according to the Corruption Perceptions Index, which is available at <http://www.transparency.org/policy_research/surveys_indices/cpi>

the mid-2000s. The promotion policy offered various preferential incentives including the provision of land in industrial zones and finance to firms that declared themselves to be export-oriented. Although these firms hired highly educated managers, they had no experience in the operation of a garment business in the international market. These firms have performed more poorly than the ready-made garment producers catering to the domestic market despite the preferential treatment.¹⁰

The above comparison provides us with several lessons. First, a labor-abundant country does not necessarily have a comparative advantage in labor-intensive garment production. This is because the Heckscher-Ohlin theorem assumes equal access to the same technology, whereas comparative advantage is determined by productivity as well as factor endowments. Second, a major determinant of productivity is technical and managerial expertise, and the best way to acquire such expertise is to learn from abroad. This is true not only in the Bangladesh case but also in cases 11 to 17 and 19, all of which are relatively successful cases. Third, compared with the paramount importance of learning from abroad as a determinant of productivity, financing and corruption are secondary issues. In all the cases listed in Table 1, the firms were founded with the entrepreneurs' own funds or the borrowing from relatives and friends, except for the state-owned enterprises (SOEs) and the township-and-village-run enterprises (TVREs) in China.¹¹ While there is much evidence that credit markets in developing countries are not working well (e.g., Beck *et al.*, 2009; Karlan and Morduch, 2009), the fact that so many industrial clusters were successfully established without using formal credits

¹⁰ After a few years, many of the export-oriented firms received only trial orders but unable to receive real orders, and their labor productivity was not significantly different from that of poorly equipped tailors and much lower than that of the best-performing factories producing ready-made garments for the domestic market.

¹¹ In the case of private firms in China, main sources of start-up fund are own fund and borrowing from relative and friends (Allen *et al.* 2005).

indicates that unfavorable access to finance is not the main constraint on the development of industries in their initiation stage when firm sizes are small.¹²

Fourth, managers and workers in the garment industry in Bangladesh know that returns to human capital investment are high partly because they have experiences of investing in their human capital and partly because the demand for skilled workers and knowledgeable and experienced managers is increasing as new firms are being established. Thus, they are keen on learning, and their human capital investment drives the industry's growth, which in turn maintains the high returns to human capital. Fifth, such a virtuous circle was initiated by the success of the Desh-Daewoo training program, which boosted the profitability of export-oriented garment production in Bangladesh. The increased profitability attracted investment in new factories by wealthy Bangladeshi families and foreign firms, which offered worthwhile jobs to the intellectual youth. Sixth, however, the Desh-Daewoo training program is difficult to replicate. This is because firms are reluctant to shoulder the cost of general training (Becker 1962).¹³ In Bangladesh, no other training program comparable to the Desh-Daewoo program in terms of the scale and quality has ever been provided by other foreign or domestic firms.

Learning from Abroad

It is small wonder that the value of learning from abroad is not well-recognized in SSA because they have not experienced the successful development of industries based on such learning. Hence, the knowledge of production technologies and management

¹² Long and Zhang (2011) find that firms provide trade credit actively to each other in industrial clusters in China, which lessens the credit constraints. Ruan and Zhang (2009) find that firm size in industrial clusters in China is small due to the division and specialization of labor among firms, so that entry barrier is reduced.

¹³ Desh canceled the contract with Daewoo after the training was completed and the vast majority of the 130 trainees soon left Desh to join new factories as managers or start their own trading houses.

cannot be taught on a commercial basis. Given this market failure, the governments in SSA should take the initiative in setting in motion the virtuous circle described above, with the aid of their development partners. A possible way of accomplishing this task is to vitalize technical and vocational education and training programs (TVET). While TVET has so far focused on the skill formation of workers, management training programs should be provided for entrepreneurs and hired managers, both present and prospective. The importance of managerial human capital and management practices to firm performance has been re-evaluated in the recent literature (e.g., Bloom and Van Reenen 2007, 2010; Bloom *et al.* 2011; Bruhn, Karlan, and Schoar 2010; Syverson 2011). The quality of TVET and other human resource development activities should be substantially improved by hiring a large number of competent foreign experts from newly industrialized countries as well as from developed countries. It is also important to provide both general and industry-specific training. The provision of various industry-specific courses corresponding to a variety of industries will help present and prospective entrepreneurs to select profitable industries to enter. As is argued by Lin and Monga (2011), the government has to identify, at least, a set of potentially profitable industries consistent with the country's comparative advantage.

An alternative strategy is to attract FDIs to the country so that potential entrepreneurs can learn from them production and management knowledge. But whether low-income countries can attract FDIs depends on business environments, which are affected by the quality of governance, business laws and regulations, the availability of auxiliary and supporting services, and infrastructures. Furthermore, foreign firms may not invest in subsidiaries in low-income countries if they anticipate that their products, production methods, and marketing channels are likely to be copied

by native workers and their customers are likely to be stolen as in cases 11, 12, and 17. While we do not deny the importance of attracting FDIs, we believe that it is risky to rely on FDIs alone as a source of new knowledge for initiating the new industry.

In addition, the results of international comparative study conducted by Eifert, Gelb, and Ramachandran (2008) indicates that firms in SSA suffer from the poor quality of basic infrastructure, such as roads, electricity, and communication networks. Thus, basic infrastructure should be provided to areas designated for industries in or near each major city. Also, the central government or local governments can assist the formation of industrial clusters by zoning areas of land for light manufacturing.¹⁴ In so doing, considerable attention should be given to the prevention of fraud and corruption.

III. Promotion of Market Transactions

In cases 1 to 10 in Table 1, the pioneer of a new industry exerted great efforts to find new production methods, sources of materials, and marketing channels. Once the new business was established, the pioneer received sizable entrepreneurial profits, despite the low quality of his or her products, because of the large demand for inexpensive products from poor domestic consumers. This profit attracted a swarm of imitators to the industry. Many of them were spin-offs, i.e., the former employees of the pioneer, and produced the same low-quality products by using the same low-quality inputs and sold their products on the same local markets as the pioneer. In this way, an industrial cluster is formed, as illustrated in Figure 1. Almost the same path was

¹⁴ For example, a part of the Kariobangi area in Nairobi was designated by the local government as an area for artisans in the late 1980s. The skilled workers who lost jobs at large factories as a consequence of the Structural Adjustment Program cleared the area to construct roads and to start their own businesses in the area, which is now a cluster of metalwork enterprises. See Sonobe, Akoten, and Otsuka (2011) for details.

followed by industries in which the initiation of the industry was based on the technology brought by FDIIs, SOEs, and international organizations (cases 11 to 17 and 19). Since the profits were reasonably high, for the time being, entrepreneurs were not particularly interested in introducing new ideas and knowledge. Hence, productivity and product quality hardly improved, but the cluster expanded in terms of the number of firms and the total output. This phase of industrial development may be termed the “quantity expansion” phase.

As a cluster expands in terms of the number of firms and their output, an increasing number of traders buying products and supplying materials come to the cluster, which makes production and transactions in the cluster more convenient. Moreover, some firms specialize in the production of parts. In other words, the division of labor between assemblers and part-suppliers and between manufacturers and traders increases with the market size (Stigler 1951; Ruan and Zhang 2009). In the transaction of final products and parts, transaction costs may arise from asymmetric information about the quality of goods to be transacted and from imperfect contract enforcement. At this stage of development, however, the problem of asymmetric information regarding the quality is not serious because all products and parts produced and transacted are standard and of uniformly low quality. The problem of imperfect contract enforcement is reduced by the community mechanism supported by the environment of the cluster in which people know each other and in which information regarding unscrupulous behavior can spread quickly, as in rural communities.¹⁵

According to Marshall (1920), the advantages of industrial clusters or

¹⁵ Hayami (e.g., 2009) argues that the community mechanism is effective not only for the enforcement of contract-based transactions but also for the management of local commons and the provision of local public goods in rural communities. In this paper, however, we focus on the enforcement of contract-based transactions.

agglomeration economies are: (1) information spillovers or imitation, (2) the division and specialization of labor among firms producing parts, components, and final products, and (3) the development of skilled labor markets. While we do not have any objections to these advantages associated with industrial clusters, we would like to point out that these benefits are intimately related to each other and also to the generally low transaction costs in the cluster. For example, information spillovers increase with spin-offs and the poaching of human resources and with transactions between firms. These benefits of being clustered explain at least partly why indigenously developed industries in developing countries are so often cluster-based.¹⁶ Huang and Bocchi (2008), Long and Zhang (2011), and Schmitz and Nadvi (1999), as well as many other studies, report that there are a large number of industrial clusters in East and South Asia and Latin America. Clusters in SSA are studied by McCormick (1999) and Sonobe and Otsuka (2011).

To recapitulate, the industrial cluster expands through the massive entry of imitators. Although imitation is often blamed for discouraging innovation, imitation is socially desirable if the probability of further innovation is sufficiently small, because new knowledge should be disseminated as widely as possible in such a case (Arrow 1962). In the quantity expansion phase, no firm is attempting innovation and, hence, the massive entry of imitators into the cluster is socially efficient. The expansion of the cluster enhances the development of the division of labor through the scale effect pointed out by Stigler (1952). The formation of a cluster also facilitates the division of labor by reducing transaction costs. According to Parker (1984) and Mokyr (1990),

¹⁶ Here we distinguish between a cluster which has been established by local firms and one led by foreign direct investment. We believe that the community mechanism of contract enforcement plays an essential role in the former case, whereas the hierarchical relationships between large foreign firms and small local firms play a critical role in the latter case.

economic growth is classified into Smithian growth – growth based on the expanded division of labor and transactions – and Schumpeterian growth -- growth based on technological progress. Cluster-based industrial development in the quantity expansion phase is clearly of Smithian growth.

At this stage, a possible role of the government is to promote market transactions by supporting the formation of industrial clusters. In the 1980s and 1990s, local governments in a large number of cities and townships in China, including our four study sites in China (cases 4, 5, 12, and 13 listed in Table 1), built large commercial premises, wherein a large number of parts-suppliers and local traders dealing in particular goods and services had shops. This policy contributed to the formation of industrial clusters (Ding 2007; Ruan and Zhang 2009). These governments also actively constructed highways and other roads and communication networks, which would be another major contribution to the Smithian economic growth of China.

IV. Correction of Remaining and Newly Arising Market Failures

As the entry of new firms unaccompanied by any improvement in product quality and productivity continues, the increased supply of their products will eventually lower the product prices and profitability. This process, illustrated by Figure 1, took place in the subsequent period of the quantity expansion phase of industrial development in all cases except for case 18 listed in Table 1. Declining profitability will induce entrepreneurs and managers to seek more profitable products (Aghion *et al.* 2005), which should be of higher quality and differentiated from the inferior products of other firms.

Quality Improvement Phase

Such an endeavor, however, does not necessarily bear fruit. While a firm may successfully improve product quality by using high-quality materials, consumers may not immediately perceive the improved quality and, hence, the new product may fail to command a high price in market. Akerlof (1970) points out that branding and quality guarantees are effective countermeasures to this problem. However, few entrepreneurs in industrial clusters in the quantity-expansion phase are familiar with such countermeasures. Moreover, since brands may be stolen, branding may have to be supplemented with the use of exclusive sales agencies and other distribution methods (Sonobe, Hu, and Otsuka 2004). Since the improved products contain differentiated parts and components, and since such intermediate goods embody new ideas, it is also important to establish trust-based, long-term subcontracting relationships with parts suppliers. In addition, to enter the high-quality segment of the market, product quality must be strictly controlled. If these reforms are successfully implemented, production can be expanded profitably. As the firm size is enlarged accordingly, the management of cash flows, inventory, and labor will assume greater importance. Good management is not an easy task for entrepreneurs in the cluster, as they have operated only small organizations and may be unaware of how to improve management. In this sense, they were far from efficient managers. They now need to study management or hire competent managers or, probably, both.

The restoration of high profitability involves these multifaceted improvements in production and management (IPM). Although IPM is not a genuine innovation, the new IPM in a cluster is similar to innovation in the sense that it is difficult to take place. Moreover, it is imitated by followers. According to our case studies, the entrepreneurs who achieved the first successful IPM in their clusters and those who imitated it quickly

tended to be highly educated. This observation is consistent with Schultz's (1975) hypothesis that the ability to deal with changing profit opportunities can be enhanced by schooling.¹⁷ Our case studies also find that these innovative entrepreneurs took advantage of the availability of a variety of human resources in the cluster, such as traders, engineers, designers, and accountants, who gathered in the clusters in the quantity expansion phase. Thus, it is fair to say that like innovation, IPM is a product of a new "combination" of existing resources, to use the expression of Schumpeter (1912).

If an entrepreneur's attempt to improve production and management miscarries, the news will be widely known quickly in the cluster, and other entrepreneurs may recoil from any new attempt at IPM. This will lead the cluster to a long-run equilibrium with low profitability, in which firms struggle for survival (see the dotted curves in Figure 1). While such "survival clusters" abound in SSA, many industrial clusters in Asia, including cases 1 to 5 and 11 to 14, succeeded in IPM and followed a path leading to the dramatic development of the industry with a smaller number of much larger firms, as illustrated by the solid curves in Figure 1. The leather shoes industry (case 15) in Addis Ababa seems to be going through IMP by incorporating production and management knowledge from Italy. The dynamic development phase that begins with successful IPM may be termed the "quality-improvement" phase.

The growth of the industry in the quality-improvement phase is Schumpeterian growth. An increasing number of firms attempt to imitate the first IPM in the cluster, and some of them further improve production and management practices. Those firms

¹⁷ Bloom and Van Reenen (2007, 2010) find that education of entrepreneurs is strongly correlated with management score in their study on management practices across firms and countries.

undertaking continual IPM will grow steadily, whereas firms that fail to keep pace with growing firms will be forced to exit the industry or will merge with growing firms. While the number of firms in the cluster will decrease as the result of exits and mergers, the total production value and employment of the cluster will continue to grow, and the products will be sold in larger markets, including export markets. Continual IPM is achieved by learning from outside of the cluster, especially from abroad. More concretely, innovative entrepreneurs acquire new knowledge of technology and management by visiting foreign countries frequently to participate in trade fairs and training programs, sending workers abroad for training, and inviting foreign experts. They may also be able to learn from foreign firms operating within their countries. Entrepreneurs in Asia have been keen on learning from the successful experiences of advanced firms in neighboring countries. Taiwan, China and Korea learned from Japan, whereas China learned from Taiwan, China and Korea as well as from Japan. At present, South Asian countries are learning from China, among other countries. By contrast, the importance of learning from abroad is not clearly recognized in SSA with only a few exceptions.¹⁸

Employment Size of Industrial Clusters

In order to illustrate how significant the industrial clusters are in terms of job creation and how different the sizes of industrial clusters are with and without successful IPM, Table 3 shows the number of manufacturing jobs and the total number of jobs (including those in garages in case 10 and subcontractors in case 14), as well as sex and schooling composition of workers in the selected industrial clusters. Since we

¹⁸ Some enterprise managers in East African countries, however, are learning from other countries by employing technicians and managerial advisers from Asia and by visiting European countries.

often failed to collect the relevant job data in case studies conducted earlier, we focus on recently surveyed industrial clusters. Except for cases 10, 14, 15, and 18, the clusters listed in this table are in the final stage of the quantity expansion phase and their employment size ranges from 600 to thirteen thousand and has been relatively stable for the last several years. The metalwork cluster in Ghana (case 10) was expanding in terms of the number of enterprises at the time of our baseline survey in 2003, but it has been in the final stage of the quantity expansion phase probably since 2005 according to the results of our follow-up surveys. The number of jobs is significantly higher in the knitwear cluster in Vietnam (case 14) and leather shoe cluster in Ethiopia (case 15), which have entered the quality improvement phase by newly introducing IPM (Sonobe and Otsuka 2011).

By far the largest is the export-oriented garment industry in Bangladesh, which employs more than 2 million workers in 2007. Although the development process of this industry has experienced several phases if one takes a closer look, it is fair to say, in comparison with many other industries in developing countries, that this garment industry experienced IPM in its earliest days (namely, around 1980) and has been in the quality improvement phase since then. This is why the industry had as many as 40 thousand workers already in 1983, just three or four years after its initiation. Needless to say, the total size of jobs would be determined by a number of factors, but it seems clear that one of them is the success or failure of IPM.

While monthly wages are low by international standard, they are lower in the garment industry than in the rolled steel, electrical fittings, and metalwork industries, because the latter jobs require special skills, which are often acquired by several years of apprenticeship. The difference in wages between SSA and Asia is not so

pronounced. The proportion of female workers is generally low and schooling levels of employed workers are also low even in Bangladesh, where many firms are large and belong to the formal sector.

Support for Cluster Development

In our view, efforts to improve production and management, which are almost the same as efforts to learn from abroad, are grossly sub-optimal in many industrial clusters, compared with the socially desirable level, chiefly for two reasons. First, rampant imitation, which is characteristic of industrial clusters, drives a wedge between the social and private benefits of IPM and discourages entrepreneurs from achieving the socially optimal level of IPM. Only a limited type of knowledge is protected, particularly in low-income countries. Second, the value of gaining new knowledge, particularly acquiring managerial knowledge, is not recognized by entrepreneurs, which drives another wedge between the social and private benefits of IPM.

There may be different approaches to altering the behavior and attitude of entrepreneurs. For example, entrepreneurs may be given pecuniary incentives to gain technical and management knowledge. Entrepreneurs, however, are likely to have no idea where to gain such knowledge. Therefore, it seems better to provide a subsidized training program for entrepreneurs, which reduces the cost of learning including search costs.¹⁹ Training programs would give rise to much more limited corruption opportunities than infrastructure projects (Shleifer and Vishny 1993). Moreover, the knowledge taught in training programs will spill over from participants to non-participants, so that the dissemination of new knowledge is achieved without much

¹⁹ Reviewing various policy options to facilitate industrialization in SSA, Page (2011) concludes that strengthening managerial capabilities of firms and facilitating clustering are key policy measures.

cost and hence be efficient. A model case is the Industrial Technology Research Institute in Taiwan, China which has facilitated the import and dissemination of foreign technologies by means of adaptive research and training (Hong and Gee 1993).

We have conducted, in collaboration with the World Bank and the Japan International Cooperation Agency (JICA), some pilot projects in which management training programs are provided for small entrepreneurs free of charge since 2007 in our study sites listed in Table 1 as cases 6, 8, 10, and 14 to 19. We found, among other things, that participants had very limited knowledge of standard management practices, and that the majority of them were willing to learn such practices (Mano *et al.* 2011; Sonobe *et al.* 2011). We randomized the selection of entrepreneurs to be invited to the training programs, in order to estimate the local average treatment effects of the training programs, whenever randomization was possible. When it was not possible, we estimated the matched double-difference average treatment effects. The estimates indicate clearly that the training programs have strong effects on the adoption of standard management practices and the willingness to pay for the admission to a similar training program in future, and that there are information spillovers from the training participants to non-participants. Our experimental data also suggest that the training participants are less likely to exit the industry, even though we need longer-run observations to confirm this further.

These results of the training experiments lend strong support to our arguments about the role that management training programs can play in promoting industrial development.²⁰ However, we must emphasize that the trial training programs that we

²⁰ These results are highly consistent with the results of other studies involving management training in developing countries (e.g., Bloom *et al.* 2011; Bruhn, Karlan, and Schoar 2010; Drexler, Fischer, and Schoar 2010; Field, Jayachandran, and Pande 2010; Karlan and Valdivia 2011)

have offered are not meant to push firms remaining in the quantity-expansion phase to enter the quality-improvement phase. The content of the training programs was too rudimentary and the training period was too short to expect such a transition to take place.²¹ Moreover, the training programs focused on management and did not include any aspect of technical training. Probably, a series of training programs are needed to impart sufficient management knowledge for successful IPM that allow trained firms to transition to the quality-improvement phase. Nonetheless, the encouraging results of our experiments suggest that further research is warranted on the impacts of training, the effective contents and design of training programs, and the way in which management and technology training is institutionalized and can be scaled up from a single cluster level to the country level.

However, once firms get started on a continual IPM trajectory successfully, they will expand production, which will aggravate congestion problems, such as insufficient work space, noise, road congestion, and the short supply of water and electricity in their clusters. In many cases, the oldest-established firms in a cluster are located in the center or the most congested part of the cluster. Their founders' highly educated children tend to undertake IPM earlier and more successfully than other entrepreneurs. These firms have stronger incentive to relocate their production bases to outside of the cluster, partly because of the severe congestion and partly because of the fear of imitation by rivals. Thus, in order to reduce congestion and to stimulate the expansion of the scale of production by rigorously growing firms, the government should invest in industrial zones with improved infrastructures.

²¹ In general we offered classroom training for three hours per day for total of 15 days. In addition we implemented on-site visits of management consultants to participating firms twice in the cases of training programs in Vietnam (cases 6 and 14), Ethiopia (case 16), and Tanzania (case 19).

In Japan; Taiwan, China; Korea; and China, the establishment of industrial zones mitigated the congestion problems in the existing industrial areas successfully and contributed to the rapid and sustained industrial growth in these countries (Levy 1991; Mano and Otsuka 2000; Henderson *et al.* 2001; Sonobe and Otsuka 2006, Chapters 2 and 3; Otsuka 2007). According to Solow (1956) model and the Cass (1965) model of economic growth, the decreasing marginal product of private capital exerts a downward pressure on capital formation and economic growth. These models predict that the mitigation of congestion due to the shortage of public capital will enhance economic growth. According to the theory of agglomeration economies (e.g., Henderson 1988; Fujita, Krugman, and Venables 1999), moreover, the mitigation of congestion allows the central areas to accommodate more innovative industrial activities, thereby contributing to further economic growth.

High-performing firms in clusters in the quality-improvement phase require finances to move from their original industrial clusters to more spacious and better-equipped industrial zones. These firms are worthy of being granted low-interest loans, in view of financial market failures evidenced by a host of empirical studies (e.g., Beck *et al.*, 2009; Karlan and Morduch 2009). The advantage of offering cheap credit to assist the industrial relocation at this stage, over the earlier stage, is that it is relatively easy to distinguish between innovative and, hence, promising firms and non-promising firms. It is desirable to link the management training programs with the provision of credit and space in the industrial zone so that firms with improved managerial and technical capabilities and, hence, higher ability to repay loans, tend to receive loans and relocate their production bases.

V. Industrial Development without Government Failure

In the previous section, we discussed that the provision of training programs, followed by the provision of adequate infrastructure and low-interest loans, which would address the major market failures that hinder industrial development, particularly the transition from the quantity-expansion phase to the quality-improvement phase.²² However, there is always the danger that government failure outweighs market failure or even aggravates the market failure. Although corruption and bribery may not be a part of government failure, they tend to be associated with the distortive government policies (Shleifer and Vishny 1993; Mauro 1995; World Bank 1997). The question is whether and to what extent our recommended industrial development policy is compatible with the prevention of government failure.

Our entrepreneur-led and government-assisted approach advocates the creation of competitive market environments by eliminating the government's economic controls, regulations, and preferential treatments in favor of particular sectors. It also recommends concerted efforts to combat corruption. These efforts are needed to realize industrial development consistent with changing comparative advantages. We also recommend investment in infrastructure in general, which is needed for the development of any economy but is prone to corruption. At least, however, this is consistent with the current policy of most developing countries, donors, and international organizations. To stimulate and accelerate the development of industries, we recommend management as well as technology training programs with a view to

²² We believe that any development strategy should specify right sequential of interventions since financial as well as human resources are limited, especially in low-income countries. Big-ban approaches, such as the big push theory and the balanced growth theory advocated by Rosenstein-Rodan (1943) and Nurkse (1953), among others, and discussed more recently by Murphy, Shleifer, and Vishny (1989), are likely to misfire.

introducing relevant new knowledge from more advanced countries. The content of the training can be general including entrepreneurship, marketing methods, accounting, product quality control, and labor management, as well as basic and general engineering theories and techniques. Whenever possible, appropriate fees should be imposed on training participants, which will reduce the room for corruption.²³ It is important to increase the awareness of the importance of proper knowledge of management and technology through public campaigns, school education, and training programs. If the true value of knowledge is widely recognized, training programs will be commercially offered by the private sector, i.e., a group of private firms or business consultants.²⁴ This does not imply, however, that solely market mechanisms can be relied upon for the provision of training because of the spillover effect of useful knowledge.

To construct industrial zones and provide low-interest loans, one possibility is to use industrial development banks (IDBs), which are quasi-governmental organizations formed with the purpose of assisting new enterprises in priority industrial sectors by providing long-term loans and a wide range of consultancy services including technical and managerial advice (George and Prabhu 2000; Alsahlawi and Gardener 2004). There is room for IDBs to play an important role in promoting new industries in low-income countries, when private banks are unwilling to bear the high risks associated with financing new enterprises or are unable to assess the profitability of long-term investments in new industrial sectors due to the lack of expertise (de Aghion

²³ Useful lessons may be learned from the use of matching grant in the technology diffusion scheme, in which cost is shared between participating firms and sponsoring organization and oversight is provided by a joint government-private supervisory committee (e.g., Biggs 1999).

²⁴ Indeed there are examples, in which large foreign firms offer the training programs to entrepreneurs. Historically, in the late nineteenth to early twentieth centuries in Japan, associations of small producers in a number of weaving districts organized training programs to learn technologies from Western countries (Hashino 2009).

1999).²⁵ IDBs played a positive role historically in Europe (e.g., Gerschenkron 1962) and in some high-performing East Asian countries (World Bank 1993). Probably, a necessary condition for the successful operation of IDBs is that IDB staffs consist of professionals of the highest caliber with skill and expertise in long-term credit analysis.

IDBs are potentially subject to rent-seeking and corruption, so that loans may be provided to politically preferred but economically inefficient projects (La Porta et al. 2000; Khwaja and Mian 2005).²⁶ In order to avoid the politicians' influence on the choice of loans and corruption, it is important to maintain the independence and autonomy of IDBs from political forces at the operational level, according to the Japanese experience (Okazaki and Ueda 1995). In order to strengthen monitoring of IDBs' lending, it makes sense to require IDBs' participation in co-financing with other financial intermediaries and international financial institutions (de Aghion 1999). Although granting the autonomy and requiring the co-financing would not eradicate the corruption and provision of credit for non-promising projects and enterprises, they are expected to reduce such undesirable lending behaviors.

In sum, our recommended industrial development policy can be compatible with the competitive policy without entailing major government failure.

VI. Concluding Remarks

The fact that so many industries are clustered in developing countries, even

²⁵ Parallel arguments are made on the rationale for the public venture capital in high income countries, which is supposed to support highly risky, high-tech enterprises (see, e.g., Lerner 2002).

²⁶ Using cross-country regressions, La Porta et al. (2000) show that the government ownership of banks leads to slower development of financial sector and slower growth of per capita income and productivity. IDBs, however, account for a small part of the government ownership of banks, i.e., 12.7%. According to Khawaja and Mina (2005), government banks in general favor politically connected firms but those set up for SMEs and agriculture display no political bias in Pakistan.

though the government does not provide any support, and that there are important market failures in industrial clusters warrants the implementation of industrial development policies. The recommended policies basically consist of the following four pillars: (1) a competition-oriented policy, (2) promotion of industrial clusters, (3) investment in managerial human capital, and (4) the construction of industrial zones and the provision of credit possibly through IDBs.

In order to induce the development path consistent with changing comparative advantages, it is essential to build and maintain competitive market environments. Viewed from this perspective, the structural adjustment policies recommended by the World Bank and IMF can have high pay-offs in the longer run. Also important is investment in social infrastructure, such as roads, electricity, water, and communication systems, without which no modern industries can develop. Since it is the insightful and competent entrepreneurs who can identify the appropriate industries with comparative advantages, what the government should do is to set the correct market signals for them and to provide general managerial knowledge and basic infrastructures. The above strategy is termed the “entrepreneur-led and government-assisted” approach.

Our presumption is that there are a number of spontaneously developed industrial clusters consisting of small firms in low-income countries. Since the industrial cluster helps markets function by reducing transaction costs, its promotion can be included as a part of market competition-oriented policy. It is also important to recognize that there are both dynamically growing and stagnant industrial clusters depending on whether multifaceted IPMs take place. In order for such IPMs to take place, innovative entrepreneurs who are competent and adept at learning from abroad are needed. Without such entrepreneurs, the industrial clusters tend to be stagnant or even shrink

due to the competition with imported commodities. In all likelihood, however, stagnant clusters can be activated if the introduction of appropriate management and technological knowledge from abroad is promoted by providing training programs for entrepreneurs and managers. Since IPM will be imitated, the social return to IPM exceeds the private return. This is the basis to provide the support for the industrial cluster by providing relevant new knowledge through training programs. Note that the content of such management training can be general and may be useful for non-clustered industries as well.

Aside from rampant imitation, the major constraints on the further development of industrial clusters are congestion and the lack of credit for sizable investments. Thus, we recommend the construction of industrial zones and the provision of credit. We do not recommend, however, such policies before the demand for infrastructure services and credit has sufficiently increased due to the IPM introduced by progressive entrepreneurs simply because the rates of return to investments in infrastructure and private capital are bound to be low if there is no prior IPM. Moreover, once IPMs take place, financial institutions, including IDBs, can identify promising firms more easily.

We believe that rather than waiting for industries in low-income countries to develop without any assistance, the time is ripe to implement empirically supported and theoretically sound industrial development policies.

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Table 1. Origin of Development of Selected Industrial Clusters in Asia and Africa

No.	Location	Main product	Origin of cluster development: initial firm type and initial product
1	Bingo, Japan	Working clothes	Farm households (traditional Japanese working clothes)
2	Hamamatsu, Japan	Motorcycles	SMEs (woodwork, loom, car repair, musical instruments)
3	Taichung, Taiwan, China	Machine tool	SMEs (simple machinery)
4	Zhili, Zhejiang, China	Baby clothes	Farm households (silk products and hand-made merchandises)
5	Wenzhou, Zhejiang, China	Electrical fittings	Farm households (repair parts for electrical fittings in SOE factories)
6	Bac Ninh, Vietnam	Rolled steel bars	Farm households (agricultural implements)
7	Sargodha, Pakistan	Electric fittings	SMEs (electrical fittings)
8	Addis Ababa, Ethiopia	Garment	Tailors (tailored suits)
9	Nairobi, Kenya	Garment	Tailors (tailored dresses)
10	Kumasi, Ghana	Metalwork	SMEs (car repair)
11	Northern Taiwan, China	Printed circuit board	FDIs (printed circuit boards)
12	Chongqing, China	Motorcycles	SOEs and FDIs (motorcycle)
13	Three cities in Jiangsu, China	Printed circuit board	SOEs and TVREs (printed circuit boards)
14	Hatay, Vietnam	Knitwear	Cooperative (knitwear for SOEs)
15	Addis Ababa, Ethiopia	Leather shoes	Migrant artisans (leather shoes)
16	Addis Ababa Ethiopia	Metalwork	Migrant artisans (metal work)
17	Nairobi, Kenya	Metalwork	FDIs and SOEs (metalwork)
18	Dhaka, Bangladesh	Garment	Training in Korea (garment)
19	Dar Es Salaam, Tanzania	Garment	UNIDO training (garment)

Notes: SMEs stand for small and medium firms. FDIs stand for foreign direct investments. SOEs and TVREs stand for state-owned firms and township-village-run firms, respectively.

Sources: Cases 1, 2, 3, 4, 5, 11, 12, and 13 are from Sonobe and Otsuka (2006); 6, 7, 8, 9, 14, 15, 16, and 17 are from Sonobe and Otsuka (2011); Case 10 is from Iddrisu et al. (2009); Cases 16 and 18 are from Sonobe et al. (2010).

Table 2. Characteristics of the Selected Industrial Clusters in Asia and Africa

No.	Cluster	Year	No. of final goods producing firms	No. of workers per firm	Education of entrepreneur (years)	Export markets
1	Working clothes, Japan	1968	200	na	10.6	Not exporting
		1998	100	na	13.7	Not exporting
2	Motorcycle, Japan	1950s	150	na	Na	Not exporting
		1965	3	na	na	Worldwide
3	Machine tools, Taiwan, China	1998	100	70	13.0	Southeast Asia
4	Baby clothes, China	1999	5000 (incl. subcons)	15	7.5	Russia
5	Elec. fittings, China	2000	200	340	10.6	Not exporting
6	Rolled steel, Vietnam	2006	133	22.1	6.7	Not exporting
7	Elec. fittings, Pakistan	2008	1200	10.0	9.4	Not exporting
8	Garment, Ethiopia	2007	700 ¹	26.1	10.1	Not exporting
9	Garment, Kenya	2002	640	4.8	8.6	Neighboring countries
10	Metalwork, Ghana	2005	500 ²	5.9	11.0	Not exporting
11	PCB, Taiwan, China	2000	60	930	13.2	Worldwide
12	Motorcycle, China	2001	50	900	15.1	Southeast Asia
13	PCB, China	2003	200	107	12.1	Not exporting
14	Knitwear, Vietnam	2007	160	12.0	7.9	East Europe
15	Leather shoes, Ethiopia	2005	1000 ³	10.1	9.2	Neighboring countries
16	Metalwork, Ethiopia	2008	130	72.5	10.8	Not exporting
17	Metalwork, Kenya	2006	150	7.2	11.0	Not exporting
18	Garment, Bangladesh	2005	4100	1231	15.0	Worldwide
19	Garment, Tanzania	2010	700	5.0	10.7	Neighboring countries

Notes:

1. About 30 firms were engaged in the factory production of ready-made garments, and the rest were tailors with own shops at which they directly contacted with consumers.
2. This is a rough estimate of the number of metalwork firms. In the same cluster, there were thousands of garages or car repairers. This number includes self-employed shoe makers who were sometimes employed by other shoemakers.

Table 3. The Number of Jobs, Monthly Wages, and Sex and Schooling Compositions of Workers in Selected Industrial Clusters

No. ¹	Cluster	Year	No. of Manufacturing Jobs (1000)	Total No. of Jobs (1000) ²	Monthly Wage (US\$) ³	% of Women	% of high school education and above
6	Rolled steel, Vietnam	2010	3.3	n.a.	161	5	0
7	Elec. fittings, Pakistan	2008	13.2	n.a.	105	10	18
8	Garment, Ethiopia	2007	7.2	n.a.	36-45 ⁴	59	17 ⁵
10	Metalwork, Ghana	2003	6.7	99.2 ⁶	32	0	25
14	Knitwear, Vietnam	2010	3.2	20-30 ⁷	59	70	25
15	Leather shoes, Ethiopia	2008	22.2 ⁵	n.a.	35-53 ⁴	23	15 ⁸
16	Metalwork, Ethiopia	2009	9.1	n.a.	63-88 ⁴	9	44 ⁸
17	Metalwork, Kenya	2008	1.2	1.7	117-208 ⁹	0	43
18	Garment, Bangladesh	2004	2,100 ⁹	n.a.	61-97 ¹¹	40	50
19	Garment, Tanzania	2010	0.6	n.a.	57	83 ¹²	11

Notes:

1. The numbers are the same as in Tables 1 and 2.
2. Including related jobs in the cluster (e.g., car repairing in the metal work cluster).
3. Converted to US dollars by the prevailing exchange rate.
4. The lower number refers to female wage and the higher one to male wage.
5. The number refers to 2009.
6. Including 80 thousand jobs generated by about 8 thousand garages.
7. Including more than 5,000 subcontractors in nearby villages.
8. Including those who have completed vocational training.
9. The lower number refers to casual worker wage and the higher one to regular worker wage.
10. The data include the employment in the country as a whole including the Greater Dhaka and Chittagong.
11. The lower number refers to casual worker wage and the higher one to regular worker wage.
12. Proportion of female owners, not workers.

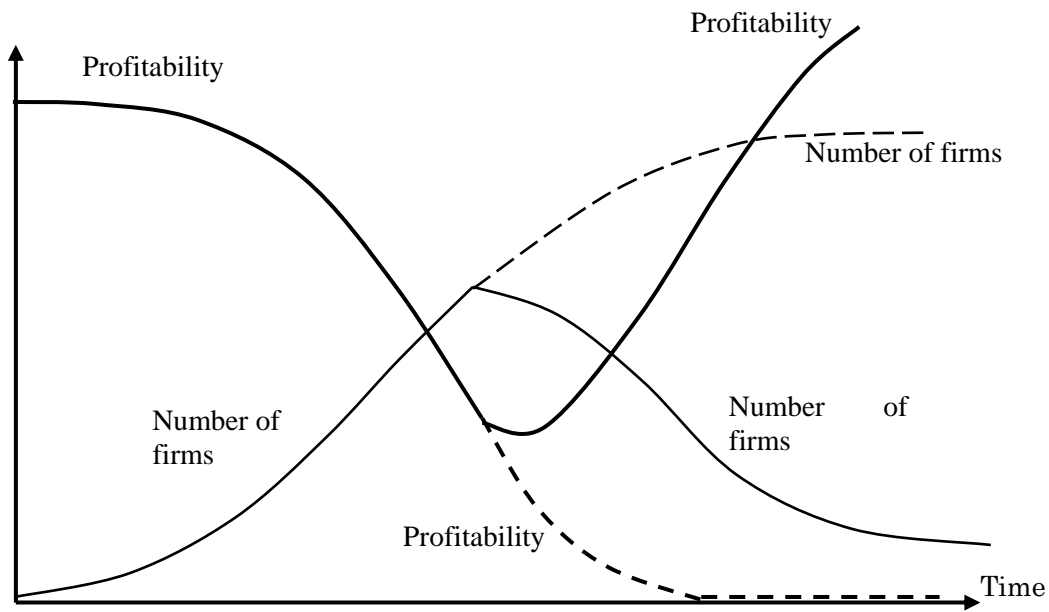


Figure 1 An illustration of development patterns of industrial clusters in terms of changing profitability and the number of firms