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Introduction

In order to reduce widespread poverty in low-income countries, it is essential to create jobs by promoting the development of labor-intensive manufacturing industries (Sonobe and Otsuka, 2006, 2011). Yet, there is no clear-cut, generally accepted, and effective strategy to develop such industries. This study attempts to provide an effective strategy to foster the development of labor-intensive industries in developing countries based on the results of management training experiments conducted in selected metalwork, garment, and shoe clusters in Ghana, Kenya, Ethiopia, Vietnam, and Tanzania, as well as on a large number of our case studies of cluster-based industrial development in Asia and sub-Saharan Africa (SSA) compiled by Sonobe and Otsuka (2006, 2011). We pay special attention to micro and small enterprises (MSEs) in industrial clusters because clusters consisting of MSEs are ubiquitous, and at least some of them seem to have high potential to grow and generate employment. The very fact that they have survived competition in the increasingly globalized world indicates that they have a comparative advantage. At the same time, the fact that only a few of them

have successfully developed warrants the detailed study of a development strategy that helps them overcome market failures without causing serious government failures.

This study postulates that efficient management is the key to innovation, which is a major engine of enterprise and industrial growth. This study also hypothesizes that management training not only enhances the management capacity of entrepreneurs but also serves as an effective screening device to identify promising and non-promising entrepreneurs, which enables targeted policies to support the former. In particular, *KAIZEN* management is found to be effective in improving production management and quality control in several countries in SSA, which supports our view that management training is an integral part of an effective industrial development strategy.

1.1 Rising opportunities for industrial development in low-income countries

According to World Bank (2012), the share of manufacturing employment and gross domestic product in industrial countries declined by roughly one-third between 1970 and 2008. As is shown in Figure 1.1, the share of manufacturing GDP has consistently declined in the USA over the last several decades. In Japan, its share increased in the 1960s but has declined since the 1970s. The Republic of Korea began its industrialization later than Japan, and the share of manufacturing in its employment and

GDP remained high until the early 1990s, when it started declining sharply. In other East Asian countries, including China, the share of manufacturing in total employment increased steadily over the last four decades. It seems clear that the location of manufacturing centers moved from developed countries, such as the United States, to Northeast Asia, such as Japan and Korea, and then to the rest of East Asia.

The pattern of industrialization in East Asia is consistent with the "flying geese" pattern of development, in which the structure of the economy has been transformed in accordance with dynamic changes in comparative advantage (Akamatsu, 1962). In other words, industrialization in East Asian countries began with the development of labor-intensive, light industries, gradually shifted to capital-intensive, heavy and chemical industries, and then finally shifted to knowledge-intensive and high-tech sectors, including ICT-based service industries. Such a structural transformation took place in response to increasing real wage rates, the accumulation of capital, and the improvement of workers' skills (Lin, 2009, 2010). In this transformation process, first Japan learned new technologies and management know-how from the western nations, then Korea and Taiwan learned from Japan and other developed countries, and finally China followed a similar path.

According to Figure 1.1, the GDP share of the manufacturing sector has begun

declining in China. Since the wage rate has been rising sharply in this country since around the turn of the century, light manufacturing industries are moving away from coastal China, where most industries have concentrated. Since China is a huge economy, small structural changes in this country could mean large changes in many other countries.

Thus, the relocation of light manufacturing industries out of China will create an immense opportunity to industrialize for countries in SSA and South Asia, which have so far failed to do so. It may be true, however, that part of the relocation is directed to the less industrialized inland areas in China because the dispersion of industrial development after the initial geographical concentration took place in Japan, Korea, Taiwan, and the United States (Henderson, Kuncoro, and Turner, 1995; Glaeser et al., 1992; Sonobe and Otsuka, 2006). Here we would like to emphasize that the extent to which the low-income countries in South Asia and SSA succeed in industrialization depends on how they can strengthen their comparative advantages in labor-intensive manufacturing industries by learning improved technology and management knowledge from more advanced economies, including East Asia.

1.2 Dominance of cluster-based industrial development

Industrial clusters can be defined in several ways, but we define them as the geographical concentration of enterprises producing similar and closely related products in a relatively small area, e.g., assemblers and part-suppliers (Sonobe and Otsuka, 2006). Most, if not all, successful industrial development is cluster-based not only historically but also at present throughout the world. The Industrial Revolution in UK was clearly cluster-based; the textile industry in Manchester and the ship-building industry in Glasgow are just a few well-known examples. Philadelphia is also known to be a center of cluster-based industries in the US. At present, IT industries are highly clustered beginning with Silicon Valley followed by Bangalore, Hyderabad, Delhi, and Mumbai. In Taiwan, it is difficult to find manufacturing industries which are not clustered (Sonobe and Otsuka, 2006). In China, there are a large number of large industrial clusters in industrialized areas, such as Zhejiang, Guangzhou, and Jiangsu provinces (Long and Zhang, 2011). Two leading industries in Bangladesh, viz., the garment and pharmaceutical industries, are also cluster-based, as will be explained in Chapter 3.

Why are growing industries so often clustered? According to Marshall (1920), there are three advantages of industrial clusters or agglomeration economies: (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. Recently, Ellison et al. (2010) empirically support the validity of Marshall's all three theories of agglomeration using the US data. 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 commonly attributed to the generally low transaction costs in the cluster. For example, information spillovers increase with spin-offs and the poaching of human resources through "labor markets" and with the transactions of improved intermediate products between contracting firms. Sonobe and Otsuka (2006) point out that in addition to these three advantages mentioned above, the cluster facilitates market transactions between traders and manufacturing firms as it reduces transaction costs. The cluster may also stimulate innovation as it attracts useful human resources for innovation, such as engineers, designers, traders, and skilled craftsmen.

These benefits of being clustered explain why indigenously-developed industries in developing countries are so often cluster-based.[1] Huang and Bocchi (2008), Long and Zhang (2011), Schmitz and Nadvi (1999), and Sonobe and Otsuka (2006) as well as many other studies, report case studies of industrial clusters in East and South Asia and Latin America. Clusters in SSA are also studied by McCormick (1999), Sonobe and

Otsuka (2011), and Mano et al. (2012), among others.

1.3 Management as a key to successful industrialization

It has been increasingly recognized that entrepreneurship holds the key to industrial development in developing countries (World Bank, 2012). Indeed, a significant number of studies find that productivity and profitability vary greatly across enterprises, even in the same industry in the same country, and that a large part of the variation can be accounted for by the difference in management practices.[2] In the past, foreign aid and government policies have not paid enough attention to the critical role played by entrepreneurship (e.g., Sievers and Vandenberg, 2007). Identifying and nurturing high-potential entrepreneurs, however, are the key to successful industrial development.

Entrepreneurship can be defined as the capacity to introduce new ideas into practice and to manage enterprise operations efficiently given the technology, which can be termed as innovation. Innovation here does not necessarily mean great scientific discovery or outstanding engineering invention but is closer to the creation of a new combination of production resources and new ways of using existing ideas to increase profits, as discussed by Schumpeter (1934). Unlike Schumpeter, however, our notion of innovation subsumes not only new ideas leading to “creative destruction” but also

"useful improvement." In the context of developing economies, innovation includes borrowing technology and management methods from abroad. The first introduction of products and production processes from developed countries into a developing country, and the first adoption of management practices that may be common in developed countries but are novel in developing countries, are considered to be innovations.

Despite its importance, we know little about the entrepreneurship of business owners and managers in developing countries.[3] Why are firms there less able to innovate and manage than their counterparts in developed countries? How can their entrepreneurship be nurtured? The ultimate purpose of this book is to explore these questions by reviewing our case studies of industrial clusters in Asia and SSA. These studies include randomized controlled trials of management training. We highlight cluster-based industrial development because low-income countries should have a comparative advantage in labor-intensive manufacturing industries, which are so often characterized by the dominance of MSEs located in industrial clusters. In other words, we are interested in cultivating entrepreneurship that will foster cluster-based MSE development since such development will be conducive to reducing poverty and crucial for inclusive growth.[4] We pay special attention to management, as its importance has

been grossly underestimated among researchers and policy-makers.

Our basic premise is that learning useful technological and managerial knowledge from abroad, as well as adopting and spreading technology, are essential elements of industrial development. It is easy to assume that technology transfers will be automatically achieved once a developing country succeeds in attracting foreign direct investments (FDIs), but according to the economics literature, that is often not the case. FDI will have little impact on the development of local indigenous industries if local businesses have little capacity to learn from foreign firms, and assimilate and adopt borrowed technologies. This is why this book discusses managerial and innovative capacities, and the role of management training in improving these capacities, with a particular focus on KAIZEN management.

1.4 What is *KAIZEN* management?

According to Imai (1997), KAIZEN is a commonsense, low-cost approach to management. Its goal is to help enterprises attain the higher quality of products and services, lower costs, and timely delivery. It is a process-oriented approach based on a belief that "processes must be improved for results to improve" (Imai, 1997, p. 4). This approach tries to improve quality, cost, and delivery (QCD) gradually by

improving work processes rather than quickly by increasing the input of materials, manpower, and machinery. Since it tries to achieve better QCD without increasing the input of resources, it is a low-cost approach. It is a commonsense approach because it does not rely on sophisticated technologies but stresses the use of common sense regarding human nature and human behavior, together with the close observation and thorough analysis of each problem in the workplace.

Both MUDA elimination and 5S are fundamental KAIZEN practices. MUDA means waste in Japanese. 5S is named after the Japanese words representing five steps of housekeeping. Their Romanized expressions commonly begin with the letter *s*. The first is SEIRI, which means classifying items in the workplace into necessary and unnecessary ones and discarding the latter from the workplace. This sorting is nothing but MUDA (waste) elimination. The concepts and practices of KAIZEN have quite a few overlaps because KAIZEN is not an axiomatic system like the Euclidean geometry but a collection of practical lessons. According to KAIZEN experts, every activity in the workplace can be classified as either value adding (not MUDA) or non-value adding (MUDA). The latter includes overproduction, excessive inventory, frequent repair and rejects, waiting time, and many actions in processing, which do not create any value from the customers' viewpoint.

KAIZEN experts believe based on the experiences of innumerable enterprises worldwide that good housekeeping should be introduced to a workplace in five steps to improve efficiency. SEIRI (sorting) is followed by SEITON (setting in order or straightening), SEISO (scrubbing or systematic cleaning), SEIKETSU (systematizing), and SHITSUKE (self-discipline or sustaining). SEITON is to set needed items in order so that workers can find them in the shortest possible time and with minimum effort. Materials should be arranged in the first-in, first-out order. Returning each tool to its designated place should be made into a habit. SEISO is to clean machinery, tools, desks, walls and floors. According to a Japanese KAIZEN expert we have hired for the on-site training of selected enterprises in SSA, more than 70 percent of sewing machine breakdowns can be prevented simply by oiling the machines, cleaning up the dust, and fastening nuts and bolts. SEISO helps to find rust, cracks, and other symptoms of malfunctions.

The implementation of SEIRI, SEITON, and SEISO, or 3S, is expected to improve QCD, safety, and morale significantly. Because unnecessary items are removed from the workshop, workers can more quickly and safely move about and transport materials between machines. If the workshop is kept neat and tidy, workers will not have to waste time looking for necessary tools and materials. Since it is easy

to see whether the workshop has a good stock of materials, operation stoppages due to the lack of materials will not occur. Because of the better maintenance of equipment, machine breakdowns occur less frequently. Thus, workers will not have to be idle frequently. .

It is not difficult for many workshops to go through 3S once. They will, however, go back easily revert to their original disorganized situation unless proper efforts are made. The fourth and fifth S's of 5S are therefore about long-term efforts to turn such making housekeeping activities into habits. SEIKETSU is to repeat 3S regularly so that the workplace is kept neat and tidy. Not just the workplace but also workers' clothes, including safety shoes, gloves, and glasses, should be properly maintained. SHITSUKE refers to the self-discipline with which workers maintain SEIKETSU by practicing SEIRI, SEITON, and SEISO continuously without being told.

When an enterprise starts KAIZEN activities such as MUDA elimination and 3S (or 5S) for its first time, the enterprise owner must explain to the workers why he or she wants to introduce KAIZEN and ask for their cooperation. Otherwise it is impossible to implement KAIZEN activities. We found that many enterprises participating in the on-site training had not had any discussion between the owners and workers for years. Both sides had experienced dissatisfaction with many aspects but had no chance to

speak to each other about their complaints. When the owner called for a meeting, therefore, the workers were surprised but welcomed the owner's idea of introducing KAIZEN and request for their cooperation. Thus, we found that a favorable effect of KAIZEN is to promote mutual understanding between the owner and workers.

The establishment of KAIZEN as standards of attitude and behaviors in the workplace will reduce variability in quality, output, cost, and delivery and increase safety in the workshop. Even after standards are established, however, the workshop may encounter abnormalities, such as defects, delays, machine breakdowns, and injuries. The responsibility of management is to take temporary countermeasures on the spot, find the root cause, and establish a new procedure that prevents the recurrence of the same problem. In exploring the root cause, the basic tenet of KAIZEN is that the root cause can be found by looking closely at the reject or the broken-down machine in the workshop and by asking "why?" repeatedly. The new procedure is formulated and incorporated in the standards. The workers should familiarize themselves with the upgraded standards through training if necessary and adhere to them.

The most important engine for continuing KAIZEN activities, however, is said to be the strong commitment and direct involvement of top management. Since KAIZEN is a process-oriented approach, it takes time for its full effects on profitability to be felt.

Probably, workers will be the first to recognize the benefits from the introduction of KAIZEN, and the owner may be the last. While workers benefit from KAIZEN, they may not have strong incentive to maintain efforts to continue KAIZEN, even though the opportunities for KAIZEN improvement are said to be infinite. If this is the case, committed managers and support from top management will be indispensable for long-term improvement.

1.5 Why is *KAIZEN* management so important?

We have observed in various countries that entrepreneurs of MSEs in stagnant clusters know that in order to increase their profits they must produce higher quality products or the same products in a more cost-effective way. However, they often fail and blame their workers, who do not know how to handle high-quality materials necessary to produce high-quality products. If, however, such entrepreneurs are asked why they do not train their workers in proper material handling and machine maintenance, they typically reply that their workers would not listen to them. The problem is that many owners and managers of MSEs do not know how to motivate their workers. That is why they should learn management.

Because there are many approaches to management, however, one may wonder

which approach to learn. Some approaches to management help top managers make quick and appropriate decisions, which is important in every business. It is also true, however, that there are cases in which workers know better than the top managers where waste exists, how to eliminate such waste, and what new systems ought to be implemented. KAIZEN is designed to encourage workers to propose new ideas for improvements of production processes and product quality. In other words, it facilitates the bottom-up flow of useful information.

KAIZEN is the wisdom accumulated over generations in Japan to achieve the further and continuous improvement of the capability of workers, who are not necessarily educated. Since it can improve the ability of everyone to earn higher income, KAIZEN is an inclusive approach. It is also fair to say that KAIZEN is a human-friendly approach as it begins with everyone in an office or workshop pausing in their work and cleaning up their workplace, without being subjected to lengthy orientations or to receive hard training. It is our belief that KAIZEN is suited to achieving the truly inclusive development of industries in many developing countries.

1.6 Applicability of KAIZEN to SSA: Illustrated evidence from Ethiopia

In response to a request of the late Prime Minister Meles Zenawi of Ethiopia, the Japan

International Cooperation Agency (JICA) decided to provide KAIZEN management training to promising large manufacturing firms in the country by dispatching several KAIZEN management experts from Japan. The training took place from October 2009 to May 2011 in Addis Ababa. The first part of the training concentrated on classroom training sessions focusing on conceptual issues of KAIZEN. In the last part of the training, the instructors focused on on-site training in which they taught the participants how to implement the KAIZEN model in their workplaces.

Thirty large and promising firms were deliberately selected by Ethiopian authorities with a view to achieving substantial growth immediately. In order to assess the effects of the KAIZEN management training on the performance of these firms, Gebrehiwot (2013) undertakes a comparison of the performance between these "treated" firms and 40 large "comparison" firms, which have not received the training. The data of the treated and comparison firms, including recall data on the situation before the training, were collected a little more than one year after the training in the period between April 2011 and June 2011.

Table 1.1 shows the data on value added and gross profit, which is defined as value added minus labor cost, of the treatment and comparison firms before and after the training program. Since the thirty treatment firms were large by intention, the

comparison firms had significantly smaller value added and profit before the training than the treatment firms. The gap between the two groups widened after the KAIZEN management training, as the value added and profit of the treatment firms increased 2.8 times and 3.1 times, respectively, whereas those of comparison firms increased only 1.4 and 1.5 times, respectively. These differences in growth are statistically significant at the 1 percent level, as shown in the far-right-hand column of the table.

Gebrehiwot (2013, p. 88) also find that the treatment firms have adopted KAIZEN management practices that they were taught more actively and invested in their workers' skill formation more than the comparison firms. Furthermore, labor productivity, measured by value added per worker, and the quality of products were positively and the production cost was negatively correlated with the adoption of improved management practices. The fact that favorable changes occurred within the scope of the KAIZEN management training, such as management practices, productivity, and product quality, suggests that the extraordinary growth in value added and profit can be attributed to the impact of this training program.

Note, however, that the treatment firms were selected into treatment not just because of their initial large sizes but also because they were expected to have high growth potential. In other words, the difference in the growth performance between

the treatment and comparison groups can also be attributed partially or even entirely to the effect of program placement in which the selection of training participants is based on their expected growth or expected ability to benefit from the training. With such program placement, even the highly significant values of the difference-in-differences (DID) estimates are merely suggestive evidence because the estimates may be biased upward. Similarly, if participation in a training program is self-selected by entrepreneurs, participants will tend to have higher expectation or ability and, hence, the estimated training impact may include selection bias.

1.7 A brief review of randomized controlled trials of management training

Management has been increasingly recognized as a major determinant of productivity in the recent economics literature (e.g., Syverson, 2004, 2011). Bloom and Van Reenen (2007, 2010) collected data on management practices from a number of medium-sized firms in developed and fast-growing countries to establish a close association between management and productivity. Using unique data, Ichinowski, Shaw, and Prennushi (1997), Lazear (2000), and Bertrand and Schoar (2003), among others, show that human resource management and top executives' management style are important determinants of productivity in the U.S.

In recent years, an increasing number of randomized controlled trials (RCTs), which compare the behavior and performance of the randomly selected treatment group with the control group, have been carried out to test the effectiveness of management training and consulting services provided to MSEs in various parts of the developing world. RCT is a way around the problem of selection bias, which arises from the systematic difference between those subject to the treatment and those not receiving the treatment (e.g., White, 2013). Karlan and Valdivia (2011), Drexler, Fischer, and Schoar (2010), and Bruhn, Karlan, and Schoar (2010) have carried out RCTs in which management training or a consulting service is provided to MSEs in their study sites in Latin America. Berge, Bjorvatn, and Tungodden (2011) and Mano et al. (2011) have conducted similar field experiments in Tanzania and Ghana, respectively.

The most clear-cut result of these experiments is that typical MSEs do not know those management practices, which are standard in many industries in the developed countries. This explains another clear-cut result, which is that rudimentary, as opposed to standard, management training improves their business practices. A somewhat discouraging result of the experiments, however, is that the estimated impacts of the management training and consulting on accounting-based business performance, such

as sales and profits, are economically large but statistically weak and in some cases insignificant.

We suspect that such discouraging results are obtained importantly because sample firms (i.e., both treatment and control groups) are selected from different industries of which some have rising output prices and others have declining prices. In other words, the firm performance data are noisy if data are taken from firms participating in different markets. We also suspect that those entrepreneurs who have adopted the training vary considerably in inherent entrepreneurship, which can lead to "economically large but statistically weak" effects of the training on their business performance.

1.8 Our approach

There is no question that RCT is a useful new tool of economics because, if properly executed, it makes it possible to accurately assess the impact of policy measures (e.g., Banerjee and Duflo, 2011; White, 2013). RCT, however, is often difficult to carry out properly for many reasons pointed out by a number of prominent researchers including Heckman (1992) and Deaton (2010). Moreover, RCT is not the only way around selection bias. Heckman and Smith (1995, p.90) argue that "the most convincing way

to solve the selection problem is to collect good data" since "selection bias arises because of missing data on the common factors affecting participation and outcome."

RCT is suitable for a type of research focusing on the assessment of the impact of particular interventions. It is not necessarily suitable for producing knowledge that would help to infer the potentials of a wide variety of alternative policies. For example, RCT does not address the question of how enterprise sizes, the educational and occupational backgrounds of the entrepreneur, and other factors that influence the willingness to participate in a management training program. Even a management training program that is shown by an RCT to be effective may not be socially beneficial, for example, if only a certain ethnic group is willing to participate in it.

The question is how to find out critically important policy measures toward economic development and the enhancement of economic welfare. It is too roundabout to apply RCT to every possible policy measure. Instead we propose to narrow down our search for such policy measures by using the conventional non-experimental analysis and use RCT, if feasible, to assess the impacts of specific programs, particularly KAIZEN management programs. This is exactly the approach we are taking in this study.

1.9 Structure of the book

This book consists of 10 chapters. Aside from the introduction (Chapter 1), there are three parts: Part I - "Management, Innovations, and Enterprise Growth," Part II - "Impacts of Management Training," and Part III - "Towards a Strategy for MSE Development." The central theme of the entire volume is to establish the proposition that the key to opening up a new avenue to enterprise growth as well as in industrial development lies in the enhancement of the managerial capacity of entrepreneurs, as it determines the success and failure of innovations.

Part I begins by characterizing the development paths of industrial clusters based on scores of our own case studies on cluster development conducted in East Asia, South Asia, and SSA, most of which are reported in Sonobe and Otsuka (2006, 2011), *Cluster-Based Industrial Development: An East Asian Model* and *Cluster-Based Industrial Development: A Comparative Study of Asia and Africa* published by Palgrave Macmillan. Chapter 2 summarizes the major types of cluster-based industrial development: (1) stagnant or "survival" clusters; (2) sustainably growing dynamic clusters; and (3) "jump-start" clusters, which learn improved technology from abroad from the inception stage of cluster development. The proximate cause for different development patterns is the success or failure of innovations, which is determined

importantly by the management capacity of entrepreneurs. Chapter 3 theoretically explains the expected impact of KAIZEN management on the performance of firms and provides supporting evidence from our past case studies.

Part II is devoted to an assessment of the impacts of *KAIZEN* management training programs provided to selected entrepreneurs of MSEs on management practices, changes in willingness to pay training fees before and after taking training, and business performance, such as revenue, value added, and gross profit. Basically, we compare the management practices, willingness to pay, and business performance between the randomly selected treatment group (i.e., those who were invited to participate in the training program) and the control group (i.e., those who were not invited). We have chosen three metalwork clusters in SSA (Chapters 4 to 6), and three garment clusters in Vietnam (Chapter 7), Tanzania (Chapter 8), and Ethiopia (Chapter 9). We have focused on these industrial clusters partly because they are labor-intensive, so that low-income countries potentially have a comparative advantage, and partly because they are ubiquitous in developing countries. Moreover, a metalwork cluster, if grown successfully, can become a so-called “supporting” industry, providing repair services for machinery from a variety of industries and producing parts and components for the machinery industries.[5] In general, we provided three-to-four week classroom training

in all the sites, as well as onsite training in the metalwork cluster in Ethiopia and the garment clusters in Vietnam and Tanzania (Chapter 6 to 8).

Part III has one chapter (Chapter 10) proposing an effective industrial development strategy based on the following empirical findings made in this study. The first major finding is that innovation is the key to the development of MSEs in developing countries. Secondly, adequate management capacity is indispensable for innovations. Thirdly, management capacity is acquired by work experience, schooling, and, most importantly, training. More specifically, learning from abroad by working for multi-national companies, by studying in schools, and by attending training programs abroad or by being taught by instructors familiar with advanced management knowledge is important for enhancing management capacity. Finally, and most importantly, while the KAIZEN management training has, in general, significant effects on management practices, the willingness to pay training fees, and the financial performance of MSEs, they are heterogeneous, implying that the effects of training differ from participant to participant. The last observation indicates that not all entrepreneurs of MSEs are promising innovative entrepreneurs. This suggests the management training should be used not only to enhance the management capacity of entrepreneurs but also to screen promising and non-promising entrepreneurs. Such

screening is easy after management training is provided because promising entrepreneurs after receiving the training will produce a visible change in the way in which their workers work. Thus, as an industrial development strategy, we propose screening promising and non-promising entrepreneurs by providing management training and then to offer targeted support to promising entrepreneurs in the form of the provision of credits and infrastructure.

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Table 1.1 Results of the KAIZEN management training in Ethiopia

	Treated (30 firms)	Comparison (40 firms)	*t*-test: DID = 0 [c]	*t*-test: DID in log = 0 [d]
Value added before training [a]	27.2	14.8		
Value added after training [a]	75.2	20.7	*t* = 5.1	*t* = 4.5
Gross profit before training [b]	21.6	12.5		
Gross profit after training [b]	67.7	18.3	*t* = 4.6	*t* = 4.4

a. Value added is defined here as sales revenue minus the costs of materials and other intermediate inputs including electricity, water, subcontracting, and transportation.

b. Gross profit is value added minus labor cost.

c. Two-tail test of the null hypothesis that the difference-in-differences (DID) is equal to zero.

d. Two-tail test of the null hypothesis that the difference-in-differences applied to the logarithms of value added or gross profit is equal to zero; that is, the treated and comparison groups had the same rates of growth in value added or gross profit.

Source: Provided by Berihu Assefa Gebrehiwot based on his Ph.D. dissertation (Gebrehiwot, 2013).

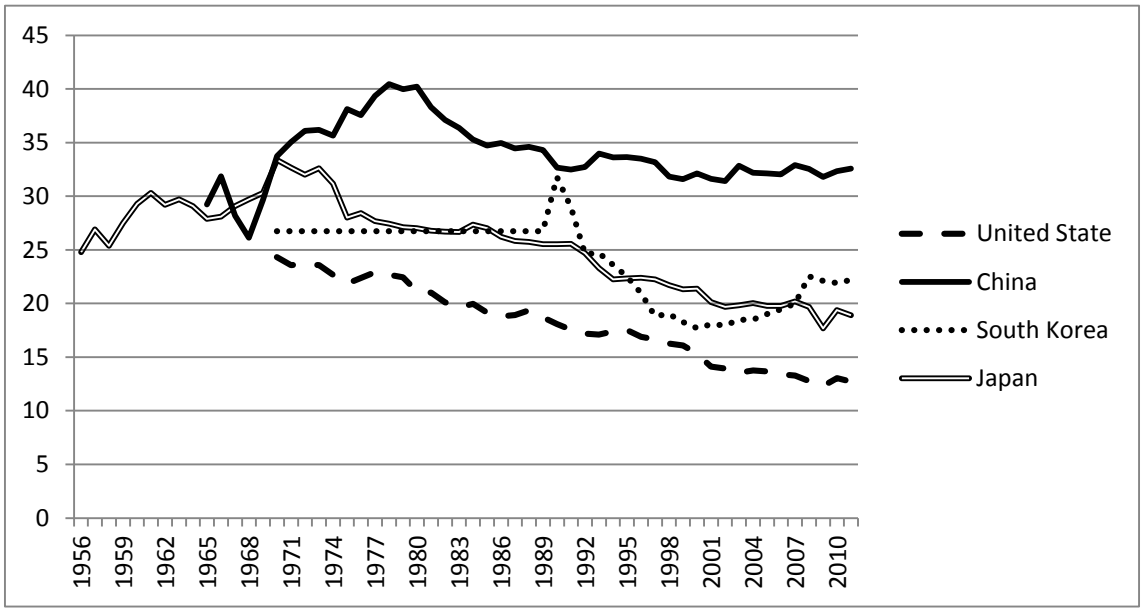

Figure 1.1 Changes in GDP Share of Manufacturing Sector in Selected Countries

Source: United Nations http://unstats.un.org/unsd/snaama/introduction.asp.